DOCUMENT RESUME

ED 457 926 JC 010 683

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TITLE General Education Skills Development: An Analysis of Students' General Educational Skills Development at College of DuPage Utilizing Three Years of CAAP Testing--1999, 2001.
INSTITUTION College of DuPage, Glen Ellyn, IL.
PUB DATE 2001-10-16
NOTE 59p.; This report was supported by Student Outcomes Assessment Committee, Office of Research and Planning, Office of the Vice President for Instruction.
PUB TYPE Reports - Research (143)
EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Basic Skills; Community Colleges; *General Education; Mathematics Skills; Minimum Competency Testing; Reading Skills; Science Process Skills; *Skill Development; *Student Evaluation; Thinking Skills; Two Year Colleges; Writing Skills
IDENTIFIERS *College of DuPage IL

ABSTRACT

This report discusses the results of the College Assessment of Academic Proficiency (CAAP) at the College of DuPage (Illinois). The CAAP is a national exam that assesses general learning in six areas: critical thinking, science reasoning, writing skills, essay writing, reading, and mathematics. Based on data from a total of 3,322 students tested between 1999 and 2001, results include: (1) entering first-year students at DuPage are significantly below four-year public college freshmen in reading skills, mathematics skills, science reasoning, and writing skills; (2) DuPage sophomores' mathematics averages significantly exceed the two-year public college norms; (3) completing sophomores are similar to other two-year public college sophomores in their writing skills, but still significantly lower than their four-year public college sophomore colleagues; (4) DuPage's students are functioning at levels similar to two-year freshmen and sophomores, but below the four-year public college level in essay-writing skills; (5) the critical-thinking skills of DuPage students, while similar to both entering first-year students and completing sophomores to their two-year public college colleagues, do not change significantly over their studies; and (6) DuPage students perform significantly lower in their science reasoning skills than four-year public college students, but, like most of the other skills, their abilities in science reasoning improve during their tenure at DuPage. (Contains 40 tables.) (EMH)

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College of DuPage

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General Education Skills Development

An Analysis of Students' General Educational Skills Development at College of DuPage Utilizing Three Years of CAAP Testing – 1999, 2001

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Acknowledgments:

This report was supported by –
Student Outcomes Assessment Committee,
Office of Research and Planning,
Office of the Vice President for Instruction.

The research model and analysis was designed and executed by –
Peter T. Klassen, Ph.D.

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Chapter

1 Assessment of General Education

Background and history

Institutional level assessment of general education at College of DuPage (COD), or any community college, is a challenging task. Consideration of the challenges can be divided into at least two distinct sets of issues. One set of issues focuses on defining general education outcomes and then operationailzing that definition with appropriate instrumentation. A second set of issues focuses on implementing the measures defined in the first focus. Responding to these challenges, Student Outcome Assessment Committee memberships have implemented three annual cycles of representative testing of general education skill. This report provides feedback to stake holders concerning our findings.

This marks the third report in this series. Data from six rounds of testing using ACT's *Collegiate Academic Assessment Profile* (CAAP) are used. These data are drawn from a random, stratified sampling of students in credit courses at the 100 or higher level. This sampling is a very strong set of data representative of the college's student body. Statistical controls are utilized to identify and control for characteristics that are known to impact the validity of comparisons among groups including student "stop-out" and reverse transfers. The following analysis includes examination and support for combining the three years cohorts. This aggregating provides sufficient numbers of cases to support parametric statistical analysis. As a part of the analysis differences among the three cycles are examined and reported on where significant differences are found.

The following report includes repetition of many explanations from previous reports. Thus, a current understanding of the assessment findings from the testing project does not require referring to previous materials.

Challenges to assessment at College of DuPage

As with any inquiry, the first steps involve identifying what one intends to study. Within the general assessment framework, student learning needs to be examined through multiple measures at multiple levels from classroom through institutional levels. Activities at classroom and disciplinary levels have been initiated and are described in other documents of the Student Outcome Assessment Committee. When considering general education assessment, two limits need to be addressed: what are the knowledge, skills, attitudes, values, and characteristics being assessed and who is eligible within the population as representative of the cohort being assessed?

Answering the first question, **"What is general education?"** is a challenge faced at any institution attempting general education assessment. Discussion and debate as to a meaning for "general education" can occupy years and careers. A choice made by members of the Student Outcome Assessment Committee was to operationalize some inquiry, accepting that future discussions and alternative measures might result in other assessment formats. Thus, these rounds of assessment of general education at College of DuPage utilized the following premises.

- General Education is learning which occurs as a result of multiple experiences and courses throughout a student's educational activities, not a specific learning resulting from a sequence of identified courses.

- General Education is defined as those ideals expressed in the following statement from the college catalog.

> The aims of general education are to enable students to understand and appreciate their culture and environment; to develop a system of personal values based on accepted ethics that lead to civic and social responsibility; and to attain the skills in analysis, communication, quantification, and synthesis necessary for further growth as a lifespan-learner and productive member of society.

Consideration of this published statement results in identification of seven competencies that may be taken as an operational definition of general education at College of DuPage.

1) An aim of general education is to enable students to **understand and appreciate their culture**

2) An aim of general education is to enable students to **understand and appreciate their environment**

3) An aim of general education is to **develop a system of personal values based on accepted ethics that lead to civic and social responsibility**

4) An aim of general education is to attain the skills in **analysis** necessary for further growth as a lifespan-learner and productive member of society. *

5) An aim of general education is to attain the skills in **communication** necessary for further growth as a lifespan-learner and productive member of society. *

6) An aim of general education is to attain the skills in **quantification** necessary for further growth as a lifespan-learner and productive member of society. *

7) An aim of general education is to attain the skills in **synthesis** necessary for further growth as a lifespan-learner and productive member of society.

It should be evident that there is no single procedure adequate to assess all of these outcomes. However, there is a core of general education competencies that can be identified as academic skills and which can be assessed using nationally standardized tests. These skills are analysis, communication, and quantification, and they are marked with *'s above. We will return to operationalizing this definition of general education later (see page 30). Continuing with defining the project, one moves to consider identification of the population.

At many colleges and universities one can clearly identify students as admitted to the college or program, graduating or finishing a program, etc. Some of these same criteria are used at College of DuPage when students in programs are clearly admitted and completed. Such is not, however, the situation with general education. Students enroll for a few courses, come to complete degrees, or come to earn enough credit to transfer. Students move on, transfer, stop-out, and are satisfied based on their own criteria. Thus, the college has no controls that would allow us to identify and encourage exit testing or assessment.

Along with this lack of clearly identified qualification, past efforts in the late 1980's by the college to recruit students' participation in testing have failed despite rewards including free course work and bookstore coupons. (It may be that the idea of **testing** is the issue, given students' willingness to participate in focus groups when offered pizza and pop.)

Responses to the assessment challenges

Designing a response to these challenges resulted in applying a process first developed by the Value Added Committee in 1986. It was that committee which first designed a random section-based sampling used to field-test the six CAAP area-tests for ACT.

Why the CAAP tests?

Since one goal of general education assessment was to provide a comparison to other institutions, selection from among three national standardized tests of general skills was undertaken rather than the development of a local college-specific test of competence. Members of the Student Outcome Assessment Committee examined prospectuses from each of the three national tests. They selected the College Assessment of Academic Proficiency (CAAP) based on four observations.

- CAAP provided national averages for both 2-year and 4-year public colleges for both first-year and sophomore levels.
- CAAP provided six separate area-tests that could be aggregated as valid and reliable institution level measurements. This feature contrasted with more global single tests from which subject area scores were derived.
- Each of these area tests could be administered in 50 minutes (according to the test protocol documents).
- CAAP was judged least dependent on specific content ideas and, therefore, was judged most likely to evaluate general learning when students were not mandated into specific core courses.

The six area-tests lined up well with a core of general education skills. The general education outcome of Analysis aligns with the CAAP area-tests of **Critical Thinking** and **Science Reasoning**. The general education outcome of Communication skills can be defined as including four skills – reading, writing, listening, and speaking. Two of these skills align with three CAAP area-tests. Writing can be assessed with the **Writing Skills** (a multiple choice test) and **Essay** Writing (a demonstrated essay) area-tests. After the first two years of testing, the Essay Writing area-test was suspended as described later (see page 38). The college level **Reading** area-test examines context reading in both the arts and social sciences. Assessment of Quantification aligns with the **Mathematics** area-test that covers material from algebra through calculus.

Assessment using locally designed questions

The CAAP instrument provided an additional resource, space for students to record nine locally designed questions. Two of these questions have been used to collect information about goals and prior college credits. Three of the questions focus on time commitments to study time, employment, and household duties. In 1999 one of the survey questions collected information about computer use. In 2001 a question was included that focused on advising and counseling services. For the past two years three of the questions have focused on assessment of some of the areas of general education not covered by the standardized tests.

Assessment of the outcomes of understanding, appreciation and development of values in the areas of culture, environment and ethics, the first three outcomes listed in the general education statement, are not as easily implemented. Since the sampling method used to administer the

CAAP provides a representative sampling of students, three of the institutional questions on the CAAP response form were designed to begin assessment of students' perceptions in these areas in 2000 and 2001. With the choice of an evaluation tool in place, the next issue was student-subject selection.

Sampling model

Because we concluded that mandatory college-wide testing was not feasible and voluntary testing efforts of the past resulted in high recruiting costs for low participation, a sampling model utilizing a stratified, random sampling of class-sections was developed. The random selection of class-sections assured testing a broad range of students with relatively low rates of non-participation. A high rate of participation is an important step in developing a representative sample. But, as may be evident and perhaps already distracting to the reader, such testing will result in the assessment of a range of students, only some of whom may match the ideal characteristics of entering first-year or completing, graduating or transferring sophomores. Utilizing this full range of students' data is an important issue we considered when designing the analysis of these data. The design of this all-encompassing analysis will be discussed later (see page 5).

Assessment tests are conducted twice a year – fall and spring rounds. In each round of assessment we attempted to gather at least 100 tests in each subject area. Thus, approximately 500 tests are administered in each of the current testing rounds. The model called for random sampling from all possible sections of introductory credit-classes (100 level single classes and sequences classes ending in 1 during the fall). During the spring the sampling was drawn from 200 level courses and end of sequences courses.

After initial identification of class-sections, the faculty assigned to each section are contacted with a request for their cooperation. Sections are drawn from throughout the college and include both full-time and part-time faculty at the Glen Ellyn campus and off-campus. Faculty cooperation has been very high with only an occasional refusal. Testing is scheduled for a specific day and time, although it is suggested that students not be told the specific date, only a range of possible dates. To encourage student cooperation, faculty are provided handouts explaining CAAP assessment, which can be distributed to students.

When CAAP tests are administered in the selected sections, each of the subject areas is rotationally assigned to some students. Thus, in any one section some students complete each of the subject area-tests.

Results from the first cycle of testing were analyzed and conclusions reported in the fall of 1999.[1] Since the sampling produced a reasonable number of cases and the analysis revealed no evidence of sampling bias, a second cycle of testing was completed in the fall of 1999 and spring of 2000 and a third in 2000-2001. The following report utilizes both of these cohorts.[2]

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[1] *An Assessment Report on Students' General Education Development at College of DuPage.* October 12, 1999. Student Outcome Assessment Committee, College of DuPage.

[2] In analyses not reported here the 2001 cohort was evaluated with regard to similarities and significant differences compared with the 1999 and 2000 cohorts. None of the differences noted were substantial or significant enough to warrant separate reporting.

Analysis model -- Questions being addressed

Given the challenges of defining and administering a pre-post test model at COD, this cross-section research design accommodates those constraints. If one accepts that a clear pre-post test model cannot be implemented, but that a representative sampling of all students can be drawn using the data collection method described, then several approaches to analysis can be implemented.

Although comparing a cross-section of students beginning their studies with another cohort near completion of their studies is a less desirable alternative than the pre-post model[3], it is a necessity. These comparisons can focus on two questions.

- Are the entering and leaving students similar to national standards for similar students at other colleges and universities?
- Is there an indication that students have changed during their studies at an institution?

In the "Comparison" chapter (see page 31) these types of models are reported. However, it needs to be noted that such comparisons are limited in the number of cases which can be classified as appropriate to the two points used in the analysis. In this round just over six hundred cases out of 2345 cases (26%) are classified as either entering first-year or completing sophomores. For the purpose of comparison a third category was defined to include those students at a mid-point in their studies. These students might be classified as end of first-year year or beginning of sophomore year. In this report they are labeled as **mid-studies.** The mid-studies classification contains an additional 26% of the cases. However, there are no national norms against which these students can be compared.

In order to make more efficient use of the tests collected, a broader analysis lies in constructing a statistical model that uses cases at all points along the educational development continuum. One approach to doing this lies in modeling general education skills development based on a continuous development over the number and type of courses taken. Such a model can use most of the data collected in that it focuses on more than the initial and final points on the continuum of learning. Such models, although more complex than the two-point analysis, can be very interesting. These models are reported starting on page 43.

Before beginning these comparisons, the characteristics of students taking one of the CAAP area-tests during the six rounds are summarized in the following chapter. These examinations focus on developing an understanding of students' characteristics.

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[3] The major limit of a cross-sectional design is that any change among subjects in skills must be more substantial in a cross-sectional design than in a pre-post design in order to attain statistical significance. Thus, as in the case of general education, where change as subtle as one-half of the beginning standard deviation are observed, the power to detect significant change is reduced from that possible in a pre-post model.

Chapter

2 Findings

General student characteristics

As previously reported, the 1999 cohort consisted of 1148 cases. The 2000 cohort contained 1191 cases. With the suspension of the use of the Essay area-test the 2001 cohort contained 979 cases. In each of the cohorts a few cases could not be matched to student records in the student tracking system; these cases were removed from the data set. Table 1 reports the numbers of tests in each of the six subject-areas by the testing cohort.

- Table 1: Distribution of area tests by cohort

		Test Cohort						
		Fall, 1998 (19991)	Spring, 1999 (19993)	Fall, 1999 (20001)	Spring, 2000 (20003)	Fall, 2000 (20011)	Spring, 2001 (20013)	Total
Writing Skills	Count	112	85	88	115	92	108	600
	% Test Cohort	18.5%	15.7%	16.9%	17.1%	19.4%	21.4%	18.1%
Math	Count	96	93	90	114	95	94	582
	% Test Cohort	15.8%	17.2%	17.2%	16.9%	20.0%	18.7%	17.5%
Reading	Count	99	96	86	109	96	102	588
	% Test Cohort	16.3%	17.7%	16.5%	16.2%	20.2%	20.2%	17.7%
Critical Thinking	Count	98	91	86	117	97	105	594
	% Test Cohort	16.2%	16.8%	16.5%	17.4%	20.4%	20.8%	17.9%
Science Reasoning	Count	96	93	86	112	95	95	577
	% Test Cohort	15.8%	17.2%	16.5%	16.6%	20.0%	18.8%	17.4%
Essay	Count	105	84	86	106			381
	% Test Cohort	17.3%	15.5%	16.5%	15.8%			11.5%
Total	Count	606	542	522	673	475	504	3322
	% Test Cohort	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Each of the cohorts represents a reasonable distribution of the area-tests. The sampling methods and the high rates of participation and effort reported later (see page 12) support a conclusion that these data are a solid and representative sampling of the college's student population. When these data are combined with information retrieved from the student tracking system, we have a rich and broad based view of students' general education skills.

These 3322 cases represent students across a spectrum of characteristics. In order to classify cases representative of target cohorts, information from the student tracking system is combined with the test results. For the purpose of comparison with the averages reported by ACT and comparison of entering first-year students with mid-studies and completing sophomores, three classification of students are made (see page 29 for a more complete explanation of this process). The following summarizing tables divide cases into two categories, those not selected

as representative of these three points and those selected as representative of the three points in a student's studies.

Table 2 summarizes the sex distribution of the sample. Fifty-six percent (56%) of the participants are female. There is no significant difference in the distribution between those in the selected and not selected cohorts.

- Table 2: Sex by selection

			Frequency	Percent	Valid Percent
Not Selected	Valid	Male	691	44.2	44.4
		Female	867	55.4	55.6
		Total	1558	99.6	100.0
	Missing	Not reported	7	.4	
	Total		1565	100.0	
Selected	Valid	Male	768	43.7	44.0
		Female	977	55.6	56.0
		Total	1745	99.3	100.0
	Missing	Not reported	12	.7	
	Total		1757	100.0	

The average age among cases selected is 22 years old with a range of 15.7 to 97 years old (s.d.=.78). Among cases not selected, the average age is 26 years old with a range of 16.8 to 94.4 years old. Cases were selected in part based on students who either began their studies at COD or cases that self-reported having earned fewer than 20 quarter-hour credits prior to attending COD. Thus, students who have college experiences from a variety of schools are less likely to be in the selected cohort and more likely to be older. Among entering first-year students, the selection criteria required enrollment during the next testing round in order to control for stop-out bias when compared with completing sophomores.

Table 3 lists the self-reported ethnic/racial categories of the participants. Eighty percent (80%) of the selected participants classified themselves as "white, Caucasian." In contrast seventy-three percent (73%) of the "Not selected" participants classified themselves in a similar category. The "Asian/Pacific Islander " category was the second largest classification at 8% among the selected cases and 12% among the not selected cases. Once again these differences reflect the life-history of the participants. Issues of race and ethnicity are complex interactions to analyze. Since it is our purpose to try to identify the impact of COD's educational processes and statistically control for other external factors, the selection of cases with the fewest external educational experiences appears warranted. It should be noted that all of the cases are used in the educational models reported later in this report (see page 43).

- Table 3: Ethnic self identification by selection

			Frequency	Percent	Valid Percent
Not Selected	Valid	Black/African - American	43	2.7	3.1
		Amer. Indian/ Alaskan Native	4	.3	.3
		White Caucasian	1021	65.2	73.1
		Mexican-American / Chicano	54	3.5	3.9
		Asian/ Pacific Islander	166	10.6	11.9
		Puerto Rican/ Cuban/ Hispanic	32	2.0	2.3
		Filipino	32	2.0	2.3
		Other	44	2.9	3.2
		Total	1396	89.2	100.0
	Missing	System missing	88	5.6	
		Prefer not to respond	81	5.2	
		Total	143	10.4	
	Total		1565	100.0	
Selected	Valid	Black/African - American	32	1.8	2.0
		Amer. Indian/ Alaskan Native	3	.2	.2
		White Caucasian	1286	73.2	80.0
		Mexican-American / Chicano	54	3.1	3.4
		Asian/ Pacific Islander	129	7.3	8.0
		Puerto Rican/ Cuban/ Hispanic	28	1.6	1.7
		Filipino	28	1.6	1.7
		Other	47	2.7	2.9
		Total	1607	91.5	100.0
	Missing	System missing	54	3.1	
		Prefer not to respond	96	5.5	
		Total	150	8.5	
	Total		1757	100.0	

The 14.2% non-native English speakers in the COD sample are substantially higher than the 3.8% and 2.9% non-native speaks found in the *CAAP User Norms* for first-year and sophomores in two-year public colleges. Eight-seven percent (87%) of the selected participants identified English as their first language compared with eight-three percent (84%) of the not selected cohort.

Seventy-five percent of the respondents reported being enrolled full-time during the quarter of their testing. Sixty-seven percent (66.6%) of the not selected cases and eighty-three percent (83.3%)of the selected cases reported full-time enrollment. Once again this difference is reflective of expectations for these cohorts.

Finally, seventy-seven percent (77.4%) of the respondents reported beginning their college enrollment at COD. Among the selected cohort 90% reported beginning at COD. In contrast only 63.1% of the cases not selected reported beginning their college enrollment here.

Table 4 lists the goals of participants. The leading goal, at 54%, is transfer to another college or university. The observation that this focus is greater than the 31% targeting an Associates Degree provides support for the observation that degree completion is not a valid criterion for evaluation of student outcomes. It should be noted that this percent of students who rank transfer as most important has been increasing over the past three years, while those ranking seeking a degree as most important has declined. Perhaps this reflects the change in emphasis from the compact structure for transfer to the I.A.A. options.

- Table 4: Most important goal

	Frequency	Valid Percent
Associates Degree	922	31.3
Certificate in specific field	147	5.0
Transfer to college or university	1587	53.8
Transfer to technical school	36	1.2
Upgrade current job skills	42	1.4
Learn a specific skill	59	2.0
Personal Interest	68	2.3
Other	88	3.0
Total	2949	100.0

Table 5 summarized responses recorded in the student tracking system. Students self-reported both plans to transfer and plans to graduate. Thirty-five percent (35%) affirmed both goals. Sixty-seven percent (67%) reported plans to transfer and not graduate. Forty-three percent (43.4%) reported plans to graduate and not transfer.

- Table 5: Plans to graduate and transfer

			Plan to transfer		
			No	Yes	Total
Plan to graduate	No	Count	817	1054	1871
		% of Total	24.7%	31.9%	56.6%
	Yes	Count	275	1161	1436
		% of Total	8.3%	35.1%	43.4%
	Total	Count	1092	2215	3307
		% of Total	33.0%	67.0%	100.0%

Table 6 summarizes the self-reported number of hours per week spent studying outside of class for the respondent's average class. Participants reported a mean average of 4.46 hours spent studying per week for their average class (s.d.= 2.68). Among entering first-year students in the selected cohort, the average study time was 3.9 hours. This increased to 4.17 hours in mid-studies students and 5 hours among completing sophomores. Among the cases not selected, the average for first-year students is slightly higher. Mid-studies selected-students study slightly less than those not selected. But selected sophomore students study almost a half-hour more than sophomores not selected. None of these differences are statistically significant in their size.

As a basis for comparison, most courses range from 3 to 5 hours. The plurality of courses is 5-quarter hours. Based on these reports and assumptions, it appears the average student spends about one hour outside of class for each hour in class. This is below the two-hour ratio suggested in both state statutes and general advising. The relationship of study time to general education skills is examined later in the modeling chapter on page 43.

- Table 6: Hours studied per week in average course

		N	Mean	Std. Deviation
Not Selected	First-year	226	3.65	2.50
	Mid-studies	393	4.53	2.57
	Sophomores	393	4.53	2.57
Selected	First-year	421	3.90	2.69
	Mid-studies	706	4.17	2.67
	Sophomores	397	5.05	2.70

One time commitment that is frequently characterized as cutting into students' studies is employment. For this examination we included recognition that volunteer activities might be considered similar to employment. This classification is not intended as a judgment of the worth of community services nor a judgment to exclude learning from community service from learning in an educational setting.

Table 7 summarizes the time spent on employment (and volunteer activities) and household tasks. The percent of participants reporting no paid employment or no household work is five to seven percent lower in the combined sample than in the 1999 cohort. The median report for employment for selected entering first-year, mid-studies, and completing sophomores was the category 16 to 30 hours per week. The median report for household work for selected first-year, mid-studies, and completing sophomores was the category 1 to 15 hours.

- Table 7: Time commitments to employment (volunteering) and household work

	Employment (volunteer)		Household	
	Frequency	Percent	Frequency	Percent
No commitments to...	441	15.0	325	11.1
1 -15 hours per week	436	14.9	1874	64.2
16 - 30	1127	38.4	390	13.4
31 - 45	711	24.2	127	4.4
Over 45 hours per week	219	7.5	203	7.0
Total	2934	100.0	2919	100.0

Observations based on three cohorts

Although comparison of the three test cohorts (1999, 2000, 2001) is not an issue being examined in this analysis, some observations need to be documented. In each of the cohorts the goal was to obtain at least 100 scores in each subject-area test (except Essay Writing) in each of the six testing cycles. Examination of Table 1: Distribution of area tests by cohort on page 7 documents that we came close to this goal.

Table 8 lists the area-test by educational level for the selected cases. It is important to note that once cases were selected, about one hundred first-year and completing sophomores were in each test-area cohort. The number of completing sophomores ranged from seventy-four to eighty-six cases. Thus, with the combination of the three years the numbers of cases utilized in the following analyses are at a level of acceptability for parametric statistical tests.

- Table 8: Area-test by educational level

	Area-test						Total
Educational Level	Writing Skills	Math	Reading	Critical Thinking	Science Reasoning	Essay	
First-year	114	110	102	123	112	103	664
Mid Freshmen-Sophomore	134	155	145	140	134	127	835
Completing Sophomores	86	74	80	86	76	44	446
Total	334	339	327	349	322	274	1945

Examinations and comparison of the three cohorts have also confirmed our expectation that the random stratified sampling of course sections produces an appropriate sample. However, there are non-biased but significant differences in some of the characteristics of these three cycles. Where these differences are of interest, they are reported with the associated observations.

The aggregating of these three cycles of testing into one set of cases for analysis has produced a sample that, as theory would predict, smoothes out the specific test cycle differences. Thus, the combined pool of participants has provided a basis for the following analysis that we conclude is a strong basis for generalization. The question of whether future assessments should be limited to data from three years or include more than three years will need to be addressed next year. At this time it appears that the number of cases is sufficient to build strong inference, and that differences among the cohorts is minimal. However, as the project progresses it is expected that including too many different cohorts will weaken usefulness of the generalizations and conclusions.

Participation and motivation

One issue of concern in considering student outcome assessment when measured in a low stakes setting, such as the CAAP testing at COD, is the impact of participation, motivation and effort by students on the measured outcomes. The sampling of class sections used to construct a random sampling and the testing procedure of unannounced testing generate a very high participation rate. One check on this participation rate is a comparison of the number of students enrolled in the sampled course-sections and the number of test takers. We have not formally collected these data, but our estimation based on total numbers tested and totals enrolled is that participation rates are between 70% and 80% of the tenth day enrollment listings. Accepting that the tenth-day enrollments contain some students not actively pursuing studies, we conclude a very high level of participation and congruence between selection and participation. The next issue concerns the effort these subjects put into testing.

Table 9 summarizes the self-report of students' efforts on the CAAP tests. The ACT Essay test form does not include response space for the institutional questions. While we tried to collect student responses from those taking the Essay test on separate pages, collection was not consistent. So none of the responses from students completing the Essay area-test have been included. Among student completing the other five subject-area tests, nineteen percent (19%) did not report their effort.

- Table 9: Self-reported effort

	Frequency	Percent
Gave no effort	69	2.9
Gave little effort	323	13.7
Gave moderate effort	938	39.9
Tried my best	1022	43.5
Total	2352	100.0

Eighty-four percent (84%) of the respondents reported that they either tried their best or gave moderate effort. The median ranking was "Gave moderate effort." This effort was consistent across the three rounds of testing. On several student characteristics there are significant differences in motivation.

Among the cases selected for the comparison and value added analysis self-report of test effort increased with course work. First-year students reported 80.6% effort in the moderate and tried my best efforts. Mid-studies students reported 82% in these same two descriptions. Completing sophomores reported 86.8% in these two descriptions. These differences were significant (X^2=14.263, sig.<.027).

Analysis of these self-reports indicates that there is a consistent and significant difference with fall participants reporting less effort than spring participants (Fall = 81% at "tried my best," and "gave moderate effort." Spring = 86% in these two categories. X^2=30.3, sig. < .000).

Examinations of these self-reports based on subject-area tests indicated a significant dependence of effort on the subject-area test (X^2=86.47, sig. <.000). Greatest efforts were reported for writing skills (90%) and critical thinking (88%). Math (82%) and reading (81%) were next in effort. The lowest effort level for science reasoning was still a solid effort at 75% in these two categories.

On average women (at 87%) reported significantly greater effort (X^2=47.39, sig. <.000) than men (79%).

Age was also significantly related to effort (X^2=95.087, sig. < .000). The general pattern indicated increased efforts with increasing age. Seventy-eight percent (78%) of the participants younger than 18 reported in the first two categories compared with 82% in the 18-24 classification. In each of the six-year categories from 25 to 55 the self-reports ranged from 85% to 100%). In the age category 61 and older effort reports fell to 58.3% for the two highest effort rankings.

Analysis of the ethnic/race reports of effort indicated that those self-identifying with Filipino, Black African-American, White Caucasian, and Asian/Pacific Islander reported similar rates of 87.8%, 85.5%, and 85% respectively. Mexican and Puerto Rican respondents reported 75% effort at the top two levels. The lowest ranking of effort came from those choosing "other" (73%). The "Native American" category contained too few cases to reliably report. These differences were significant (X^2=39.492, sig.<.009).

There was no significant difference between the three test-cycle cohorts except the seasonal effect noted above. There was no significant difference in the efforts reported by students speaking English as their first language and those who did not speak English as their first language.

During the spring 2001 test round the Student Outcomes Assessment Committee implemented a random award of one gift certificate for $10 in each of the class sections. Implementing this was not difficult. As a part of the preparation for testing, this random reward was announced. After each class test session an answer sheet was drawn at random and the sheet checked for self-reported effort in the top two categories and no evidence of patterned answering. The gift certificate was sent back to the cooperating teacher who delivered the certificate to the student, as she/he considered appropriate. Comparisons of the self-reported motivation from each of the spring rounds of testing indicate a consistent 3.3 ranking. Thus, there was no apparent impact of these gift certificates on the self-reported motivation. However, this is not to say that the acknowledgement as an indication of thanks is of no public relations importance. Given the low costs associated with this activity, it should continue for another round in Spring 2002.

In conclusion, while there may be some minor evidence of "alienation," whether focused on hostility towards schooling or testing, overall the participation and motivation of respondents is considered appropriate and acceptable.

Chapter 3

Development in cultural and environmental appreciation and ethical responsibility

The implementation of CAAP testing was recognized as a starting point for assessing general education skills. It was accepted that the subject-area tests covered only a core of the outcomes targeted in the goal statement. The challenge of how to assess other areas of general education and the availability of locally designed questions on the CAAP form supported collecting a brief survey of a representative random sample. Starting with the 2000 cycle of assessment, three of the locally designed questions focused assessment on the impact of courses on enabling students to understand and appreciate their culture and environment and develop a system of personal values based on accepted ethics that lead to civic and social responsibility. While there may be more authentic measures than self-report, at this time the only indicators available for consideration of these general education areas are self-report responses. The following summaries are based on all of the cases collected. Thus the entering freshmen cohort contains both persisting students and stop-outs. These summaries can serve as a baseline for dialogue and future assessments of these areas of student acquisition of general education.

The form of the questions was similar.

- Based on your experiences at College of DuPage, how have your courses impacted your **understanding and appreciation of your culture**?
- Based on your experiences at College of DuPage, how have your courses impacted your **understanding and appreciation of the environment**?
- Based on your experiences at College of DuPage, how have your courses helped you **develop personal values based on accepted ethics that lead to civic and social responsibilities**?

Responses for each of the questions were parallel.

0. I've not completed enough courses to make a judgment.
1. My COD education has had no impact on....
2. My COD education has had little impact on....
3. My COD education has had moderate impact....
4. My COD education has had meaningful impact....
5. My COD education has had very significant impact....

Appreciation of one's culture

As with most general education outcomes, examination of development of values and attitudes over a series of courses is important. Table 10 lists the impact of course work on cultural appreciation by educational level. Nineteen percent (18.5%) of first-year students rank courses as having meaningful or very significant impact on their appreciation of culture. Among completing sophomores, 33.7% rank their COD courses' impact as meaningful or very significant

on development of a cultural appreciation. The data supports concluding that as students continue their studies at COD the percent of students who rate their COD courses as having meaningful or very significant impact on their cultural appreciation increases (X^2=27.068, sig.<.001).

- Table 10 Courses' impact on cultural appreciation by educational level

Educational Level		No Impact	Little Impact	Moderate Impact	Meaningful Impact	Significant Impact	Total
Entering First-year							
	Count	35	29	24	15	5	108
	% within Education	32.4%	26.9%	22.2%	13.9%	4.6%	100.0%
Mid-studies							
	Count	85	66	96	52	12	311
	% within Education	27.3%	21.2%	30.9%	16.7%	3.9%	100.0%
Completing Sophomores							
	Count	45	53	75	63	25	261
	% within Education	17.2%	20.3%	28.7%	24.1%	9.6%	100.0%
Total							
	Count	165	148	195	130	42	680
	% within Education	24.3%	21.8%	28.7%	19.1%	6.2%	100.0%

Appreciation of one's environment

Table 11 lists the rankings from participants of their COD course's impacts on environmental appreciation. Thirty-four percent (33.6%) of first-year students rank their course work as having meaningful or very significant impact of appreciation of the environment. In contrast, thirty-one percent (30.5%) of the completing sophomores ranked their courses as having similar impact on their environmental appreciation. Among mid-studies students, rankings in these categories fall to 16.8%. Analysis supports concluding that course impact rating is not independent of educational level (X^2=38.462, sig.000). Comparison of the percents in the lower rankings suggests that the there is a decrease in those ranking no or little impact and an increase in moderate impact while the higher ranking remains stable.

- Table 11 Courses' impact on environmental appreciation

Educational Level		No Impact	Little Impact	Moderate Impact	Meaningful Impact	Significant Impact	Total
Entering First-year							
	Count	33	18	28	35	5	119
	% within Education	27.7%	15.1%	23.5%	29.4%	4.2%	100.0%
Mid-studies							
	Count	74	79	106	41	10	310
	% within Education	23.9%	25.5%	34.2%	13.2%	3.2%	100.0%
Completing Sophomores							
	Count	33	68	79	63	17	260
	% within Education	12.7%	26.2%	30.4%	24.2%	6.5%	100.0%
Total							
	Count	140	165	213	139	32	689
	% within Education	20.3%	23.9%	30.9%	20.2%	4.6%	100.0%

Development of personal values based on accepted ethics that lead to civic and social responsibility

Table 12 summarizes impact and educational level of rankings of participants concerning their evaluation of the impact of their COD courses on development of values based on accepted ethics that lead to civic and social responsibility. Once again, impact is dependent on educational level indicating increasing impact over the course of students' studies (X^2=30.935, sig.000). Although starting out as the lowest ranking of impact among first-year students (29.5%), the completing sophomore "meaningful" or "very significant" rankings are highest at 39.2%.

- Table 12: Personal Values based on ethics

	No Impact	Little Impact	Moderate Impact	Meaningful Impact	Significant Impact	Total
Entering First-year						
Count	32	22	37	25	13	129
% within Education	24.8%	17.1%	28.7%	19.4%	10.1%	100.0%
Mid-studies						
Count	57	73	124	56	14	324
% within Education	17.6%	22.5%	38.3%	17.3%	4.3%	100.0%
Completing Sophomores						
Count	37	45	75	68	33	258
% within Education	14.3%	17.4%	29.1%	26.4%	12.8%	100.0%
Total						
Count	126	140	236	149	60	711
% within Education	17.7%	19.7%	33.2%	21.0%	8.4%	100.0%

Development of appreciation and values

Examination of each of the three patterns of responses in the previous tables is complex. In each area the percent of respondents ranking their course experience as having "no" or "little" impact on appreciation and development in the area decreases substantially between first-year and completing sophomore students. In both the cultural and ethical development areas the percent ranking the impact at the higher level substantially increases between first-year and completing sophomore students. The pattern among mid-studies students is not consistent. The rise and fall of rankings brings to mind the observations that students enter college sure that there is a right answer and that their course work will deliver it. Then their studies lead them to enter a stage of increased skepticism and uncertainty prior to developing a complex and conditional logic of critical thinking. It's important to note that these observations may provide insight into the challenges of developing critical and complex thinking skills.

Chapter

4 Advising and Counseling

Shortly after the Student Outcomes Assessment Committee began its first round of general education skills testing in the Fall Quarter of 1998, the committee was challenged by faculty to look at student services within the institutional framework. One response to this challenge lies in the use of one of the nine locally designed questions on the CAAP form. The following question was included for the first time in the Fall 2000 testing cycle and repeated in the Spring 2001 cycle.

> **"How much have you used Advising and Counseling services, and what impact has that had on your college success?"**

The question comprises two issues -- level of use and importance. Responses are reported using ten multiple-choice codes.

0) No enough contact to determine
1) Minimal contact, not helpful
2) Minimal contact, helpful
3) Minimal contact, very helpful
4) Moderate contact, not helpful
5) Moderate contact, helpful
6) Moderate contact, very helpful
7) Substantial contact, not helpful
8) Substantial contact, helpful
9) Substantial contact, very helpful

The question asks students to rank "***advising*** and ***counseling***" services. The two words carry different and significant connotations among those well informed about the college's organization and staffing. The goals and objectives of these two efforts represent important but separate efforts. Among "those in the know," the combining of these two components may be too high a level of aggregation. However, I doubt that students are aware or impacted by these organizational issues. I, therefore, posit that the question is a good summative look at the combined impact of this area of student service.

Table 13 summarizes responses from the 979 respondents in this year's two testing cycles. Of these only 26 did not answer the question.[4] Given this very high level of response we judged that the question, despite its complex nature, was understandable and usable.

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[4] The multiple component form of the question is more complex than a two-question series. The complex format has been a concern to some people because they think students may be having a hard time responding using the complex response matrix. It would be ideal to have this question broken out into two questions. However, given the limited number of survey response items, and the need to collect other information this is not possible. The high response rate of over 97% supports concluding that students did not have substantial problems understanding and responding to the question, although it may have taken them longer to decode than a two-

- Table 13: Reported advising and counseling contact and value

	Frequency	Percent	Valid Percent
Not enough contact to determine	280	28.6	29.4
Minimal, not helpful	142	14.5	14.9
Minimal, helpful	218	22.3	22.9
Minimal, very helpful	36	3.7	3.8
Moderate, not helpful	37	3.8	3.9
Moderate, helpful	137	14.0	14.4
Moderate, very helpful	38	3.9	4.0
Substantial, not helpful	17	1.7	1.8
Substantial, helpful	32	3.3	3.4
Substantial, very helpful	16	1.6	1.7
Total	953	97.3	100.0
Missing	26	2.7	
	979	100.0	

The two-component format of the question is complex and a single listing of responses is of limited interpretive value. Therefore, responses were coded into two variables – advising and counseling level of contact, and value of advising and counseling among those who thought they have enough contact to make a judgment.

Table 14 summarizes the student rankings of value by contact among the 673 students reporting enough contact to make a value judgment. These rankings represent a college wide average. The relationship between contact and value is statistically significant (X^2= 34.193, sig. .000). Since the X^2 test evaluates categorical data, not linear trends, interpretation is limited to saying that within a table knowing the level of contact significantly predicts the probabilities of the associated value ranking.

At all levels of contact, sixty-four (64.1%) to seventy-four percent (73.8%) of the respondents value that contact as helpful or very helpful. This strong endorsement should be the overall conclusion. Other areas that might be considered lie in following-up with those ranking the services as not helpful. Among those with minimal contact thirty-six percent (35.9%) see that contact as not helpful. This will probably lead to their not continuing that contact, although if they do they may improve their ranking of the services. Among those with substantial levels of contact twenty-six percent (26.2%) rank that contact as not helpful. This may be attributed to either un-realistic expectations or severity of issues that exceed the capacities of student advising/counseling programs.

question format. A change in the visual formatting of a similar question is being attempted to see if such appearance cues may help reduce the response time.

- Table 14: Advising and counseling contact by value

		Minimal contact	Moderate contact	Substantial contact	Total
Not helpful	Count	142	37	17	196
	% Advising Worth	72.4%	18.9%	8.7%	100.0%
	% Advising Contact	35.9%	17.5%	26.2%	29.1%
Helpful	Count	218	137	32	387
	% Advising Worth	56.3%	35.4%	8.3%	100.0%
	% Advising Contact	55.1%	64.6%	49.2%	57.5%
Very helpful	Count	36	38	16	90
	% Advising Worth	40.0%	42.2%	17.8%	100.0%
	% Advising Contact	9.1%	17.9%	24.6%	13.4%
Total	Count	396	212	65	673
	% Advising Worth	58.8%	31.5%	9.7%	100.0%
	% Advising Contact	100.0%	100.0%	100.0%	100.0%

Given the variety of students' goals, the first comparison presented in Table 15 focuses on a comparison of advising and counseling contacts by self-selected goals. The level of contact with these services is significantly related to these goals (X^2= 40.020, sig. .007). Students with focused goals (i.e. upgrade a skill, learn specific skill and personal interest) have lower levels of contact with advising and counseling than do those with general goals (i.e. degree, certificate and transfer). The highest level of contact arises among those targeting transfer to a technical school (37.5%) and those seeking an Associate degree (32.1%) and transfer (29.7%).

- Table 15: Goals by advising/counseling contact

		Not enough to rank	Minimal contact	Moderate contact	Substantial contact	Total
Associates Degree	Count	74	103	63	21	261
	% Most Important Goal	28.4%	39.5%	24.1%	8.0%	100.0%
Certificate in specific field	Count	19	21	5	5	50
	% Most Important Goal	38.0%	42.0%	10.0%	10.0%	100.0%
Transfer to college university	Count	135	243	127	33	538
	% Most Important Goal	25.1%	45.2%	23.6%	6.1%	100.0%
Transfer to technical school	Count	4	6	4	2	16
	% Most Important Goal	25.0%	37.5%	25.0%	12.5%	100.0%
Upgrade current job skills	Count	7	4	2		13
	% Most Important Goal	53.8%	30.8%	15.4%		100.0%
Learn a specific skill	Count	9	6	3	1	19
	% Most Important Goal	47.4%	31.6%	15.8%	5.3%	100.0%
Personal Interest	Count	14	6	3	1	24
	% Most Important Goal	58.3%	25.0%	12.5%	4.2%	100.0%
Other	Count	16	7	5	1	29
	% Most Important Goal	55.2%	24.1%	17.2%	3.4%	100.0%
Total	Count	278	396	212	64	950
	% Most Important Goal	29.3%	41.7%	22.3%	6.7%	100.0%

Table 16 focuses on the self-reported value of advising and counseling contacts by the students' goals. In this examination there is no significant relationship between their goals and the value they perceive in their contact with these services (X^2= 14.786, sig. .393).

- Table 16: Advising/counseling value by goal

		Not helpful	Helpful	Very helpful	Total
Associates Degree	Count	46	107	34	187
	% Most Important Goal	24.6%	57.2%	18.2%	100.0%
Certificate in specific field	Count	14	13	4	31
	% Most Important Goal	45.2%	41.9%	12.9%	100.0%
Transfer to college or university	Count	119	237	47	403
	% Most Important Goal	29.5%	58.8%	11.7%	100.0%
Transfer to technical school	Count	4	5	3	12
	% Most Important Goal	33.3%	41.7%	25.0%	100.0%
Upgrade current job skills	Count	2	4		6
	% Most Important Goal	33.3%	66.7%		100.0%
Learn a specific skill	Count	3	6	1	10
	% Most Important Goal	30.0%	60.0%	10.0%	100.0%
Personal Interest	Count	3	7		10
	% Most Important Goal	30.0%	70.0%		100.0%
Other	Count	5	7	1	13
	% Most Important Goal	38.5%	53.8%	7.7%	100.0%
Total	Count	196	386	90	672
	% Most Important Goal	29.2%	57.4%	13.4%	100.0%

In addition to the primary goal question on the CAAP form, the student tracking system contains two separate student self-reports from contact at registration on plans to graduate and plans to transfer. The following four examinations utilize these two variables.

Table 17 summarizes the levels of contact with advising and counseling by plans to graduate. Although there are slightly higher levels of contact among those planning to graduate, there is no significant relationship (X^2= 5.790, sig. .122).

- Table 17: Advising/counseling contact by plans to graduate

		No	Yes	Total
Not enough to rank	Count	167	109	276
	% Plan to graduate	32.4%	25.5%	29.2%
Minimal contact	Count	209	186	395
	% Plan to graduate	40.5%	43.5%	41.8%
Moderate contact	Count	106	104	210
	% Plan to graduate	20.5%	24.3%	22.2%
Substantial contact	Count	34	29	63
	% Plan to graduate	6.6%	6.8%	6.7%
Total	Count	516	428	944
	% Plan to graduate	100.0%	100.0%	100.0%

Table 18 summarizes evaluations of advising and counseling by plans to transfer. Although those who plan to transfer run 31% with moderate to substantial contact compared with 23.2% for those who do not plan to transfer, these differences are not generally accepted as significant given the 944 cases (X^2= 7.193, sig. .066).

- Table 18: Advising/counseling contact by plans to transfer

		N	Y	Total
Not enough to rank	Count	90	186	276
	% Plan to transfer	33.2%	27.6%	29.2%
Minimal contact	Count	118	277	395
	% Plan to transfer	43.5%	41.2%	41.8%
Moderate contact	Count	51	159	210
	% Plan to transfer	18.8%	23.6%	22.2%
Substantial contact	Count	12	51	63
	% Plan to transfer	4.4%	7.6%	6.7%
	Count	271	673	944
Total	% Plan to transfer	100.0%	100.0%	100.0%

A similar pattern emerges in the relationship between evaluations and plans to graduate or plans to transfer. In Table 19 evaluations are not significantly different among those who plan to graduate and those who do not (X^2= 1.308, sig. .520).

- Table 19: Advising/counseling by plans to graduate

		No	Yes	Total
Not helpful	Count	103	92	195
	% Plan to graduate	29.5%	28.8%	29.2%
Helpful	Count	204	179	383
	% Plan to graduate	58.5%	56.1%	57.3%
Very helpful	Count	42	48	90
	% Plan to graduate	12.0%	15.0%	13.5%
Total	Count	349	319	668
	% Plan to graduate	100.0%	100.0%	100.0%

In Table 20 evaluations are not significantly different among those who plan to transfer and those who do not (X^2= .745, sig. .689).

- Table 20: Advising/counseling value by plans to transfer

		No	Yes	Total
Not helpful	Count	54	141	195
	% Plan to transfer	29.8%	29.0%	29.2%
Helpful	Count	106	277	383
	% Plan to transfer	58.6%	56.9%	57.3%
Very helpful	Count	21	69	90
	% Plan to transfer	11.6%	14.2%	13.5%
Total	Count	181	487	668
	% Plan to transfer	100.0%	100.0%	100.0%

Table 21 summarizes advising and counseling contact by sex. There is a significant difference between males and females contact level (X^2= 7.302, sig. .063). Males report a slightly higher rate of "not enough contact." Although males have somewhat higher rates of "minimal contact" and "substantial contact than women these differences are not substantial. The female rate for "moderate contact" is substantially higher than the male rate.

- Table 21: Advising/counseling contact by sex

		Sex		
		Male	Female	Total
Not enough to rank	Count	140	140	280
	% Sex code	31.5%	27.5%	29.4%
Minimal contact	Count	189	207	396
	% Sex code	42.6%	40.7%	41.6%
Moderate contact	Count	82	130	212
	% Sex code	18.5%	25.5%	22.2%
Substantial contact	Count	33	32	65
	% Sex code	7.4%	6.3%	6.8%
Total	Count	444	509	953
	% Sex code	100.0%	100.0%	100.0%

Table 22 summarizes the value of these contacts by sex. There is no significant difference in these rankings between males and females (X^2= .358, sig. .836).

- Table 22: Advising/counseling value by sex

		Sex		
		Male	Female	Total
Not helpful	Count	91	105	196
	% Sex code	29.9%	28.5%	29.1%
Helpful	Count	171	216	387
	% Sex code	56.3%	58.5%	57.5%
Very helpful	Count	42	48	90
	% Sex code	13.8%	13.0%	13.4%
Total	Count	304	369	673
	% Sex code	100.0%	100.0%	100.0%

The CAAP instrument provides seven racial and ethnic categories for self-designation by the respondent. Utilizing seven categories to examine contact and value is not effective since many of the non-white categories contain only a few cases. Aggregating several of the categories results in data that can be considered. Both the "African-American/Black" and "white/Caucasian" categories were retained. Respondents selecting the categories of Native American, Other, and Prefer not to respond were assigned to missing data. The Chicano and Hispanic categories were collapsed into one category. In a similar way the Filipinos and Asian Pacific Islanders were combined. This recoding resulted in four racial/ethnic categories. The level of advising and counseling service contact by these four categories is reported in Table 23. Racial and ethnic categories do not have a significant relationship with the level of contact (X^2= 13.388, sig. .146).

- Table 23: Advising/counseling contract by ethnic category

		Not enough to rank	Minimal Contact	Moderate Contact	Substantial Contact	Total
White, Caucasian	Count	196	270	140	36	642
	% Ethnic Category	30.5%	42.1%	21.8%	5.6%	100.0%
Black/African - American	Count	8	7	7	4	26
	% Ethnic Category	30.8%	26.9%	26.9%	15.4%	100.0%
Mexican-American, Chicano, Puerto Rican, Cuban, Hispanic	Count	11	20	14	6	51
	% Ethnic Category	21.6%	39.2%	27.5%	11.8%	100.0%
Asian/ Pacific Islander, Filipino	Count	26	50	30	11	117
	% Ethnic Category	22.2%	42.7%	25.6%	9.4%	100.0%
Total	Count	241	347	191	57	836
	% Ethnic Category	28.8%	41.5%	22.8%	6.8%	100.0%

When examining the relationship of ethnic and racial categories with value a conclusion is less certain. Table 24 summarizes value by ethnic racial group. The relationship of race-ethnicity to value is weak, and is not independent (X^2= 10.986, sign. .089). Given that this relationship is based on 595 cases the relationship would generally be judged as not significant. However, it may be intuited that there may be a weak relationship between these categories and their associated values.

- Table 24: Advising/counseling value by ethnic category

		Advising Counseling Worth			
		Not helpful	Helpful	Very Helpful	Total
White, Caucasian	Count	137	255	54	446
	% Ethnic Category	30.7%	57.2%	12.1%	100.0%
Black/African - American	Count	4	8	6	18
	% Ethnic Category	22.2%	44.4%	33.3%	100.0%
Mexican-American, Chicano, Puerto Rican, Cuban, Hispanic	Count	14	19	7	40
	% Ethnic Category	35.0%	47.5%	17.5%	100.0%
Asian/ Pacific Islander, Filipino	Count	20	58	13	91
	% Ethnic Category	22.0%	63.7%	14.3%	100.0%
Total	Count	175	340	80	595
	% Ethnic Category	29.4%	57.1%	13.4%	100.0%

One student characteristic that might impact both use and worth of advising and counseling is language. The CAAP instrument provides a space for students to self-identify their English language background. Table 25 summarizes advising and counseling contact for native speakers of English and those for whom English is not their first language. Native speakers of English are less likely to have contact with or have lower levels of contact with advising and counseling than non-native speakers of English (X^2= 15.863, sig. .001).

- Table 25: English as first language by advising/counseling contact

		English First Language		Total
		No	Yes	
Not enough to rank	Count	31	249	280
	% English First Language	21.2%	31.0%	29.5%
Minimal contact	Count	55	338	393
	% English First Language	37.7%	42.1%	41.5%
Moderate contact	Count	42	169	211
	% English First Language	28.8%	21.1%	22.3%
Substantial contact	Count	18	46	64
	% English First Language	12.3%	5.7%	6.8%
Total	Count	146	802	948
	% English First Language	100.0%	100.0%	100.0%

Table 26 summarizes the evaluations of native and non-native speakers of English. Although non-native speakers of English report more contact with advising and counseling, their evaluation of these services are not significantly different from native English speakers (X^2= 4.175, sig. .124).

- Table 26: English as first language by advising/counseling value

		English First Language		
		No	Yes	Total
Not helpful	Count	30	166	196
	% English First Language	26.1%	30.0%	29.3%
Helpful	Count	63	320	383
	% English First Language	54.8%	57.9%	57.3%
Very helpful	Count	22	67	89
	% English First Language	19.1%	12.1%	13.3%
Total	Count	115	553	668
	% English First Language	100.0%	100.0%	100.0%

While these institutional summaries may provide a baseline indication of contact and value, it does not help us understand some of the underlying process. The following analyses utilize the three classifications of educational levels (see page 29). Table 27 summarizes the entering first-year, mid-studies, and completing sophomores rankings of advising and counseling services.

Comparisons of level of contact and impact among educational levels

The first and most striking observation is that over 45% of the entering first-year students have not had enough contact to rank these services. While this lack of contact declines significantly, it should be noted that these rankings were made during the fifth and sixth week of a term. By the time students are completing their COD learning, forty-six percent (46%) have had moderate or substantial contact with advising and counseling. And all but seventeen percent (17%) have had at least minimal contact.

- Table 27: Educational level by advising/counseling contact

		Entering First-year	Mid-Studies	Completing Sophomores	Total
Not enough contact to rank	Count	83	26	20	129
% Classified Educational Level		45.6%	22.0%	17.4%	31.1%
Minimal contact	Count	60	62	42	164
% Classified Educational Level		33.0%	52.5%	36.5%	39.5%
Moderate contact	Count	33	23	41	97
% Classified Educational Level		18.1%	19.5%	35.7%	23.4%
Substantial contact	Count	6	7	12	25
% Classified Educational Level		3.3%	5.9%	10.4%	6.0%
Total	Count	182	118	115	415
% Classified Educational Level		100.0%	100.0%	100.0%	100.0%

Table 28 lists the values rankings of advising and counseling by educational categories. Between sixty-three (63%) and seventy-four percent (74%) of these students find counseling and advising services either helpful or very helpful. A pattern that may be worth examining further is the increasing percent of completing sophomores who rank these services at "not helpful." As the pattern indicates that as students complete their studies some raise their evaluation while a larger portion lower their rankings of these support services. This may be due to changes in the issues faced by students as they near completion. Or it may be due to frustrations when their expectations that someone else will provide guaranteed answers are unmet.

- Table 28: Educational level by advising/counseling value

		Entering First-year	Mid-studies	Completing Sophomores	
Not helpful	Count	16	26	35	77
% Classified Educational Level		16.2%	28.3%	36.8%	26.9%
Helpful	Count	69	57	46	172
% Classified Educational Level		69.7%	62.0%	48.4%	60.1%
Very helpful	Count	14	9	14	37
% Classified Educational Level		14.1%	9.8%	14.7%	12.9%
Total	Count	99	92	95	286
% Classified Educational Level		100.0%	100.0%	100.0%	100.0%

Given the previous observation concerning the 45.6% of first-year students reporting not enough contact to rank these services, Table 29 examines these first-year students with reference to their persistence or stop-out behavior. It is important to keep in mind the observation that stop-out does not mean these students did not transfer mid-year to other institutions. While there is no significant difference in the level of contact between these two classifications (X^2= 2.897, sig. .408), persisters have a lower level of no contact and higher level of minimal contact than stop-outs. Thus, it appears that first-year students' outcomes in terms of persistence may be influenced by their contact with these student services or the contact level may reflect individuals' commitment and involvement. Other first-year research would lend credence to the contact and a road to college success.

- Table 29: First-year outcome by advising/counseling contact

		Native first-year outcomes		
		Stop-out	Persist	Total
Not enough to rank	Count	23	54	77
	% Native first-year outcomes	53.5%	43.5%	46.1%
Minimal contact	Count	9	43	52
	% Native first-year outcomes	20.9%	34.7%	31.1%
Moderate contact	Count	9	23	32
	% Native first-year outcomes	20.9%	18.5%	19.2%
Substantial contact	Count	2	4	6
	% Native first-year outcomes	4.7%	3.2%	3.6%
Total	Count	43	124	167
	% Native first-year outcomes	100.0%	100.0%	100.0%

Chapter

5 Comparisons

In this chapter we utilize two approaches in examining the acquisition of general education skills at an institutional level. One approach utilizes comparison of entering first-year and completing sophomores to national averages for 2-year public community college students. This comparison is expanded with comparison with 4-year public university averages. A second approach utilizes comparisons among College of DuPage's entering first-year students, mid-studies, and completing sophomores.

These comparisons require classification of cases based on students' course completion at COD and other colleges. This classification is necessary in order to identify learning outcomes resulting from COD experiences, not skills acquired at other colleges. This may appear to be an easy task, but it's not. Two specific issues need to be considered in order to control for identifiable biases. The general process is to use information from the student responses and student-tracking system (STS) to identify "ideal" COD cases, that is cases that would be typical of various stages in a student's studies if we were able to collect longitudinal developmental measures.

One issue of concern in cross-sectional comparisons such as these is the impact of attrition or stopping-out. The research design applied to control for the first-year stop-out effect utilizes enrollment information from the STS for students' subsequent enrollment in the next testing round. Entering first-year students taking a CAAP testing in the fall round must be enrolled in the following spring round of testing in order to be classified as persisting. In a similar process those entering first-year students tested in the spring must be enrolled in the following fall in order to be classified as persisting. Those entering first-year students who are not enrolled in the subsequent testing round are classified as stop-outs. A traditional assumption, perhaps incorrect, might be that stop-outs may be primarily lower achievers. If this (or the opposite) is the case, then a bias is introduced in comparing entering cross-sections with persisting cross-sections. Such a bias might be labeled as a "freshmen survival effect." To avoid this bias, in the comparisons that follow persisting first-year students are compared with mid-studies, and completing sophomores. Specific comparisons of persisting students with those stopping-out are presented later, but as a general observation the differences are not substantial and sometimes in a direction opposite from expectations (see page 42).

A second issue is that arising from the impact of reverse transfer. Determining the level of college studies for the native students beginning studies at COD is difficulty using the STS. For students who begin at other colleges and universities, there are several sources that may be used as a basis for this classification. In general students with few credits from other institutions may be classified into the comparison cohorts, while those with higher numbers of credits and degrees are excluded from these comparisons but included in the model building examinations starting on page 43.

The process of classification for all students is similar. First, students self-reported on the CAAP answer sheet their educational level as freshman, sophomore, junior, senior, and other. Students also self-reported the number of credits earned and the number of credits earned at other colleges. The student tracking system (STS) is a second major source of information. Several indicators in the STS are used. Two indicators of educational level were retrieved from STS. First, the total credit hours earned at COD in college-level courses (=>100) at the end of

the quarter during which testing occurred were identified. Second, utilizing transcripts (from the student tracking system) the cumulative number of college-level courses (=>100) successfully completed in each of eight subject-discipline areas and the total number of courses successfully completed were tallied. In addition to COD experiences, students' self-report of credits and degrees completed at other institutions need to be considered.

The process of classifying student educational level involved utilization of all of these measures. One might hope that all of these measures might have general congruence for all of the cases. Unfortunately, some tend not to agree. To resolve conflicts the two measures from STS were considered more reliable than student self-reports.

Educational level categories for analysis were defined as 1) entering persisting first-year students, 2) mid-studies – students between entry and completion, and 3) completing sophomore. To operationalize these definitions, the distribution of credits earned at COD and at other colleges was examined. Based on these examinations the following definitions were established.

Entering persisting first-year (1) earned 20 or fewer quarter hours at the end of the quarter during which they completed the CAAP test. Further, in these comparison entering first-year students were included in analysis only if they self-reported beginning their studies at COD (classified as a "native-student") and if they persisted to the next testing round.

Mid-studies (first-year/sophomores) (2) earned between 41 and 60-quarter hours at the end of the quarter during which they completed the CAAP test. Classification of mid-studies included students who reported earning fewer than 21 quarter-hour credits at other college or universities.[5]

Completing sophomores (3) earned between 81 and 110-quarter-hours[6] at the end of the quarter during which they completed the CAAP test. This classification also included students who reported earning fewer than 21 quarter-hour credits at other colleges and universities.

This classification system is effectively applied to native-students (self-reported that their studies began at COD), although even here there are a number of students who self-report a different classification than that identified through the STS. This classification procedure also worked for those cases who reported earning very few credits at other schools but who did not begin their studies at COD. This classification scheme resulted in educational levels 1, 2, and 3 for those meeting the criteria specified above and 1.5, 2.5 for those cases with few credits from other colleges whose COD credits ranged between the three classifications defined.

A greater challenge is classifying reverse transfer students who transfer in more than 20 quarter-hours credit. For those cases that were not native-students, several classification routines were

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[5] Including non-native cases reporting few transfer credits was based on a comparison of these students reported in *An Assessment Report on Students' General Education Development at College of DuPage*, October 12, 1999.

[6] The upper limit defined in classification of educational level was identified during previous research. It was noted at that time that the sampling method included a few "perpetual" students earning credits well beyond the 96 quarter hour credits required for graduation and/ or transfer. Since the focus of this research is on the acquisition of general education skills, I judged that the few cases with course credits beyond 110 quarter-hours were outliers and were not representative of the general student population. Thus, these cases were not used in making comparative evaluations.

applied. The self-report of credits earned at other colleges were factored into an estimation of total credits. These projections resulted in educational levels ending in decimal fractions.

Thus, in the following analysis, selection of cases with educational levels of 1, 2, or 3 provided clear categories of students meeting specified criteria. These cases are most representative of COD learning outcomes. This selection was used in all of the following comparisons. The remaining cases with decimal educational levels were added to the selected cases for some of the descriptive analyses and the modeling which follows on page 43.

COD and national norms

One of the reasons for selecting ACT's *Collegiate Assessment of Academic Proficiency* (CAAP) was to provide a reference norm for comparison with COD outcomes. The annual publication of standardized norms provides such a reference. In the case of this analysis the *Fall, 2000 CAAP User Norms* are referenced.[7]

Table 30 through Table 35 list the mean-average and other statistical information for each of the three classifications of educational level on one of the subject-area tests. Also listed on each table are the ACT-CAAP 2-year public college and 4-year public college national averages. As with any comparison of average drawn from samples, one must consider a margin of error before concluding significant differences.

In order to compare the COD averages with those from one of the reference groups, a 95% Confidence Interval has been calculated. The Confidence Interval is a range of scores representing the upper and lower bounds that the mean-average might be if the entire population of students were tested rather than sampled. In other words, in the reading skills area-test, we can be 95% certain that the entering COD first-year student average would fall between 58.73 and 60.8. In a similar manner, we are 95% certain that the freshman 2-year public college average is between 59.36 and 59.6. Since the confidence interval for COD entering first-year students overlaps with the confidence interval for 2-year public college freshmen, we can conclude that the difference between the COD average of 59.76 and the 2-year public college average of 59.6 is not statistically significant.

This procedure has been applied to each of the tables and the observations are summarized prior to the supporting table.

Reading skills

Data from Table 30 indicates that entering COD first-year students are similar to the average of 2-year public college freshmen. Entering first-year students are significantly below first-year 4-year public college freshmen. Completing COD sophomores have improved the rank of reading skills in a manner similar to the 2-year public college sophomore cohort. Although their average is still below the 4-year public college sophomore norm, the COD confidence interval is not statistically lower than the 4-year public college cohort. Given the increase across the three-measurement points, it is reasonable to conclude that reading skills increase across COD course

[7] The *CAAP User Norms: Fall, 2000* are based on the average of the previous three years' test takers who self-identified into the categories described in the published classification categories. Thus, the averages we used were a general summary of students reporting first-year and sophomore status at 2-year and 4-year public colleges. In general these averages would tend to describe entering first-year and completing sophomores, but it should be noted that the averages are not criterion based.

of study. COD students show an increase exceeding the 4-year public cohort change. This may indicate that there is an upper limit to college reading skills or a threshold on the CAAP measurement of these skills. Thus, COD students may pick up a bit, but not fully, relative to 4-year public college students.

The first-year to sophomore changes in reading scores are in marked contrast to the findings reported in the first year, preliminary assessments. Given the large number of cases and wider sampling, the current findings are considered representative. Two factors may play a role in what we can now classify as a substantial change.

First, the developmental/remedial curriculum was changed just prior to the first round of testing in the fall of 1998. Based on the curriculum change and mandatory placement for students with low reading pre-tests, both the number of students enrolling in developmental reading classes, and the number of sections of these classes doubled in 1998-1999. These numbers have continued to increase in the last two years. Thus, at the onset of testing the percent of students with one or more developmental courses was lower than it is now after three years of higher participation rates.

It is also possible, although there is no way to test the hypothesis, that after the targeting of college level reading skills in the fall of 1999, that changes in faculty pedagogies may have impacted student skill development. Responses after the announcement, and continuing anecdotal reports indicate a number of faculty reporting that they have made some changes in teaching strategies in order to help students strengthen their college reading skills.

- Table 30: Reading skills comparison

College of DuPage Average	Entering First-year	Mid-studies	Completing Sophomores
N	81	147	83
Mean	60.04	60.06	61.88
Std. Deviation	5.3	5.3	5.3
Std. Error	0.59	0.44	0.59
95% Confidence Interval	1.98	1.98	1.99
Lower Bound	58.86	59.19	60.71
Upper Bound	61.22	60.93	63.05
2-Year Public College Average			
N	1792		21618
Mean	59.6		61
Std. Deviation	5.1		5.3
Std. Error	0.12		0.04
95% Confidence Interval	1.96		1.96
Lower Bound	59.36		60.93
Upper Bound	59.84		61.07
4-Year Public College Average			
N	4385		30570
Mean	62.1		63.0
Std. Deviation	5.2		5.1
Std. Error	0.08		0.03
95% Confidence Interval	1.96		1.96
Lower Bound	61.95		62.94
Upper Bound	62.25		63.06

Mathematics skills

Data from Table 31 indicates that COD first-year students enter with an average math skill similar to 2-year public freshman cohort. COD first-year students are significantly lower than the 4-year public freshman cohort. Math skills improve across their COD studies with significant gains between both first-year and mid-studies as well as between mid-studies and completion. COD completing sophomores' averages significantly exceed the 2-year public college norms. That COD average also significantly exceeds the 4-year public college sophomore mean. That this gain occurs is laudable, at what cost may be a question as evident from articles in the student newspaper and student in-class success rates. The conundrum of these multiple indicators indicates the presence of an issue broader than the inquiry of this review.

- Table 31: Mathematics skills

College of DuPage Average	Entering First-year	Mid-studies	Completing Sophomores
N	81	156	78
Mean	56.62	57.52	59.24
Std. Deviation	4.23	4.30	5.12
Std. Error	0.46	0.34	0.58
95% Confidence Interval	1.98	1.98	1.99
Lower Bound	55.71	56.84	58.09
Upper Bound	57.53	58.20	60.40
2-Year Public College			
N	2828		21221
Mean	56.3		56.3
Std. Deviation	3.9		3.5
Std. Error	0.07		0.02
95% Confidence Interval	1.96		1.96
Lower Bound	56.16		56.25
Upper Bound	56.44		56.35
4-Year Public College			
N	4554		34639
Mean	58.1		58.4
Std. Deviation	3.9		4
Std. Error	0.06		0.02
95% Confidence Interval	1.96		1.96
Lower Bound	57.99		58.36
Upper Bound	58.21		58.44

Writing skills

Data from Table 32: Writing skills(a multiple choice test) indicates that entering first-year COD students are similar to 2-year public college freshmen in their writing skills. These cases are significantly lower than 4-year public college freshmen. During their studies COD students improve their writing skills significantly by the time they are completing sophomores. Completing sophomores are similar to 2-year public college sophomores, but still significantly lower in their skills than their 4-year public college sophomore colleagues.

- Table 32: Writing skills

College of DuPage Average	Entering First- year	Mid-studies	Completing Sophomores
N	81	137	93
Mean	60.65	61.15	62.80
Std. Deviation	5.19	5.40	5.42
Std. Error	0.58	0.46	0.56
95% Confidence Interval	1.98	1.98	1.99
Lower Bound	59.50	60.24	61.68
Upper Bound	61.80	62.07	63.91
2-Year Public College Average			
N	2915		23861
Mean	61.2		62.6
Std. Deviation	5		4.7
Std. Error	0.09		0.03
95% Confidence Interval	1.96		1.96
Lower Bound	61.02		62.54
Upper Bound	61.38		62.66
4-Year Public College			
N	5171		35568
Mean	62.5		64.5
Std. Deviation	5.6		4.6
Std. Error	0.08		0.02
95% Confidence Interval	1.96		1.96
Lower Bound	62.35		64.45
Upper Bound	62.65		64.55

Critical thinking skills

Data from Table 33: Critical thinking skills indicates that the skills of COD students, while similar as both entering first-year students and completing sophomores to their 2-year public college colleagues, does not change significantly over their studies. It should be noted that while the averages improve, that improvement is not statistically significant. This lack of significant change may, however, be the result of small sampling size, constrains imposed by the statistical procedure, or limits in sensitivity to change of the critical thinking area-test. The first-year to sophomore change in scores is examined in the next chapter using ANOVA, a more sensitive statistical test. The results reported on page 40 indicate that theses change do attain statistical significance.

- Table 33: Critical thinking skills

College of DuPage Average	Entering First-year	Mid-studies	Completing Sophomores
N	94	140	87
Mean	59.27	61.59	61.48
Std. Deviation	5.06	5.66	5.68
Std. Error	0.52	0.4780	0.61
95% Confidence Interval	1.98	1.98	1.99
Lower Bound	58.23	60.65	60.27
Upper Bound	60.30	62.54	62.69
2-Year Public College Average			
N	4526		18417
Mean	59.7		61.1
Std. Deviation	5		5.2
Std. Error	0.0743		0.0383
95% Confidence Interval	1.96		1.96
Lower Bound	59.55		61.02
Upper Bound	59.85		61.18
4-Year Public College Average			
N	5292		8435
Mean	61.3		62.3
Std. Deviation	5.2		5.4
Std. Error	0.0715		0.0588
95% Confidence Interval	1.96		1.96
Lower Bound	61.16		62.18
Upper Bound	61.44		62.42

Science reasoning skills

Data from Table 34 indicates that COD's entering first-year students and completing sophomores are similar to their 2-year colleagues, and significantly lower than 4-year public college colleagues. Our students improve their science reasoning skills during their tenure at COD. It should be noted that although the test is labeled as science reasoning, examination of the test items indicate a test of concrete and logical reasoning and interpretation of data provided in charts, graphs, etc. These skills then are similar to not only life and natural science, but also many of the social and behavioral sciences.

- Table 34: Science reasoning skills

College of DuPage Average	Entering First-year	Mid-studies	Completing Sophomores
N	78	134	76
Mean	56.97	58.49	59.79
Std. Deviation	4.10	4.65	4.71
Std. Error	0.46	0.40	0.54
95% Confidence Interval	1.98	1.98	1.99
Lower Bound	56.05	57.70	58.71
Upper Bound	57.89	59.29	60.87
2-Year Public College			
N	1382		13248
Mean	57.7		59.0
Std. Deviation	4.1		4.2
Std. Error	0.1103		0.0365
95% Confidence Interval	1.96		1.96
Lower Bound	57.48		58.93
Upper Bound	57.92		59.07
4-Year Public College			
N	3173		25659
Mean	60.2		61.1
Std. Deviation	4.5		4.5
Std. Error	0.0799		0.0281
95% Confidence Interval	1.96		1.96
Lower Bound	60.04		61.04
Upper Bound	60.36		61.16

Essay writing skills

Data from Table 35 indicates that COD's students are functioning at levels similar to 2-year freshmen and sophomores, and 4-year freshmen; but below the 4-year public college level. These data come from the first two of the three cycles of testing. After confirming that COD students were functioning at level, the Essay Writing testing was suspended since the instrument did not provide sufficient sensitivity to change in student essay skills. At this time the Student Outcomes Assessment Committee is discussing development of an in-class essay sample procedure to replace the Essay Writing test from ACT.

- Table 35: Essay writing

College of DuPage Average	Entering First-year	Mid-studies	Completing Sophomores
N	71	135	49
Mean	3.28	3.23	3.31
Std. Deviation	0.64	0.66	0.69
Std. Error	0.0765	0.0565	0.0980
95% Confidence Interval	1.98	1.98	2.01
Lower Bound	3.13	3.12	3.11
Upper Bound	3.34	3.34	3.51
2-Year Public College			
N	3223		6535
Mean	3.2		3.1
Std. Deviation	0.6		0.6
Std. Error	0.0106		0.0074
95% Confidence Interval	1.96		1.96
Lower Bound	3.18		3.09
Upper Bound	3.22		3.11
4-Year Public College			
N	3389		15982
Mean	3.0		3.3
Std. Deviation	0.5		0.6
Std. Error	0.0086		0.0047
95% Confidence Interval	1.96		1.96
Lower Bound	2.98		3.29
Upper Bound	3.02		3.31

First-year, mid-studies, completing sophomores – value added

A second approach to considering the acquisition of general education skills focuses on changes from first-year students' skills to completing sophomores' skills. This approach to analysis utilizes classification of cases based on quarter-hour credits at the time of testing. These classifications were previously defined (see page 30).

Two statistical tests can be considered as addressing this focus. The results of applying a t-test to examine significant change between entering-persisting first-year students and completing sophomores are listed in Table 36. The means for persisting first-year students and completing sophomores being compared are listed in Table 37. The changes from first-year to completion are significant for five of the six area-tests, with the Essay writing as the only area-test in which COD students do not show significant improvement. As mentioned previously, use of this test has been suspended due to a low level of sensitivity to change (see page 38).

- Table 36: t-tests comparing first-year and completing sophomores

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Writing Skills Score	Equal variances assumed	.518	.473	-2.651	172	.009
	Equal variances not assumed			-2.659	170.404	.009
Math Skills	Equal variances assumed	5.432	.021	-3.570	157	.000
	Equal variances not assumed			-3.556	147.594	.001
Reading Skills	Equal variances assumed	.045	.832	-2.210	162	.029
	Equal variances not assumed			-2.210	161.917	.029
Critical Thinking Skills	Equal variances assumed	2.363	.126	-2.776	179	.006
	Equal variances not assumed			-2.763	172.570	.006
Science Reasoning Skills	Equal variances assumed	2.572	.111	-3.958	152	.000
	Equal variances not assumed			-3.950	147.986	.000
Essay Skills	Equal variances assumed	.063	.802	-.269	118	.788
	Equal variances not assumed			-.266	99.105	.791

Comparisons among the three educational levels may also be of interest. Table 37 lists each of the six subject-area test score averages for the three educational levels of students. Comparisons of the averages for the three educational levels indicate that each of the six-subject area averages tended to increase. Five of the six changes were identified as statistically significant using ANOVA analysis. Changes in essay writing were not significant. Since this approach uses a more precise approach than the confidence intervals applied in the previous section, these findings may be more helpful to knowing when changes occur during a student's study.

In the case of writing skills there is significant change between first-year students and completing sophomores. There is a significant change between mid-studies and completing sophomore students, but not during the first year. Thus, it appears that these skills are developed throughout a student's tenure with acceleration during the second year.

In the case of math skills there are significant changes between first-year students and completing sophomores. There is significant change between mid-studies and completing sophomores, but not first-year and mid-studies. Thus, it appears that these skills are developed throughout a student's tenure with acceleration during the second year.

Significant changes in reading skills occur between entry and completion. It is interesting to note that significant changes only appear in the mid-studies to completing sophomore cohorts. The patterns of reading scores have made the most change over the past three years' reports. It is possible that program changes as discussed on page 32 may offer explanation for the instability of conclusions. At this point, after three years, the impacts of changed curriculum and faculty pedagogy may have worked their way through a major portion of the student body. Given these changes it should be noted that the effects from mandatory developmental reading courses and responses to the challenges of low reading skills identified in the first year's report have not stabilized. This is an area that will require continued evaluation in order to adequately identify both changes and conditions.

Comparison of the conclusions based on t-tests and ANOVA analysis of Critical Thinking skills with those of the confidence intervals comparisons (on page 36), illustrate the increased sensitivity of the t-tests and ANOVA tests. Critical thinking skills increase significantly between first-year and completing sophomores. The increase from first-year to mid-studies is significant, while that from mid-studies to completing sophomore is not significant.

A somewhat similar pattern emerges when examining Science Reasoning skill development. The change from first-year to completing sophomore is significant. The change from mid-studies to completing sophomore is not significant. The change from first-year to mid-studies is significant only if one applies a 10% willingness to accept a type I error. Given that both groups have over 100 cases each, I find that .1 standard too generous, and conclude that the change from first-year to mid-studies is also not significant.

- Table 37: Summary of significant differences among COD education levels

			ANOVA F ratio and Scheffe Significance of Change		
	N	Mean	First-year to mid-studies	Mid-studies to completing sophomore	First-year to completing sophomore
Writing Skills			F= 4.021, sig. at 019		
First-year	81	60.65			
Mid-studies	137	61.15	n.s. .802		
Comp. Soph.	93	62.80		.075	.033
Total	311	61.51			
Math Skills			F = 7.141, sig. at .001		
First-year	81	56.62			
Mid-studies	156	57.52	n.s. .340		
Comp. Soph.	78	59.24		.022	.001
Total	315	57.71			
Reading Skills			F = 3.576, sig. at .029		
First-year	81	60.04			
Mid-studies	147	60.06	n.s. .999		
Comp. Soph.	83	61.88		.047	n.s. .088
Total	311	60.54			
Critical Thinking Skills			F = 5.904, sig. at .003		
First-year	93	59.23			
Mid-studies	140	61.59	.006		
Comp. Soph.	87	61.48		n.s. .989	.024
Total	320	60.88			
Science Reasoning Skills			F = 7.480, sig. at .001		
First-year	78	56.97			
Mid-studies	134	58.49	n.s. .064		
Comp. Soph.	76	59.79		n.s. .138	.001
Total	288	58.42			
Essay			F = .335, not sig. at .715		
First-year	71	3.2782			
Mid-studies	135	3.2278			
Comp. Soph.	49	3.3112			
Total	255	3.2578			

As a general conclusion, we may accept that COD students make progress in gaining general education skills. These patterns of change support the generalization that general education skills development is a process that spans a number of courses and years and is not the result of a limited number of specifically designated courses. The acquisition of these skills is in line with progress made at other 2-year public colleges as represented in the ACT's published averages. However, it may be worth discussing whether being "average" is a sufficient goal for College of DuPage.

Stop-out versus persisting first-year students

Table 38 lists the mean average for first-year persisting first-year students compared with those who stop-out. The averages are statistically significant in their differences for only age and math score. The Essay score differences could be argued as different if one accepts a generous level of error. Among first-year students those who stop-out are older by 1.5 years, and they have substantially lower math skills. As one might predict for persisting students, class study time is higher and employment hours lower. Although not significant, it is interesting to note that both critical thinking and science reasoning are higher for stop-out than for persisting students. This may be a reflection of the difference in age, which supports the argument that these skills are developmentally related to maturity and may not be total dependent on academic learning.

- Table 38: First-year Comparison Persister v. Stop-out

	Native First-year outcomes	N	Mean	St. Deviation	Significance
Age at testing	Stop-out	184	9.77	23.02	T= 2.116
	Persister	486	7.59	21.51	Sig. .035
Writing Skills Score	Stop-out	36	5.46	60.56	
	Persister	81	5.19	60.65	
Math Score	Stop-out	32	4.78	54.06	T=-2.66
	Persister	81	4.12	56.62	Sig. .010
Reading Score	Stop-out	21	5.00	58.71	
	Persister	83	5.34	60.00	
Critical Thinking Score	Stop-out	27	5.86	59.59	
	Persister	96	5.07	59.29	
Science Reasoning Score	Stop-out	33	3.57	58.00	
	Persister	78	4.10	56.97	
Essay	Stop-out	39	0.87	3.05	T=-1.872
	Persister	78	0.69	3.35	Sig. .066
Average class study time	Stop-out	146	2.52	3.48	
	Persister	428	2.71	3.86	
Employment (volunteer)	Stop-out	148	1.24	1.94	
	Persister	428	1.17	1.78	
Household work	Stop-out	146	0.99	1.19	
	Persister	426	0.92	1.15	

Chapter 6

Modeling the acquisition of general education skills

The previous chapters of this analysis focused on the levels of general education skills development attained by specific classifications of College of DuPage students. This chapter will examine the relationship between measured student characteristics, actions, and courses with general education skills development. This analysis is organized in two ways. First, each of the six subject area models will be presented. Second, patterns of common influences and non-significant effects in general education skill acquisition will be identified starting on page 51.

Modeling Method

The models developed in this chapter are based on structural equations predictions. Model development begins with a fully specified model of twenty exogenous variables, nine of which are counts of courses in discipline areas, three of which are pre-test scores, three of which are hours spent on study, employment, and household work. The remaining five exogenous variables are gender, English as a second language, age, self-reported motivation on the test and credits earned at other colleges. Three intervening variables included are GPA earned at completion of the quarter when tested, total completed developmental credits and the total number of college credits (equal to or greater than 100) earned by completion of the quarter when tested. Figure 1 presents this model. Needless to say, this is a very complex model.

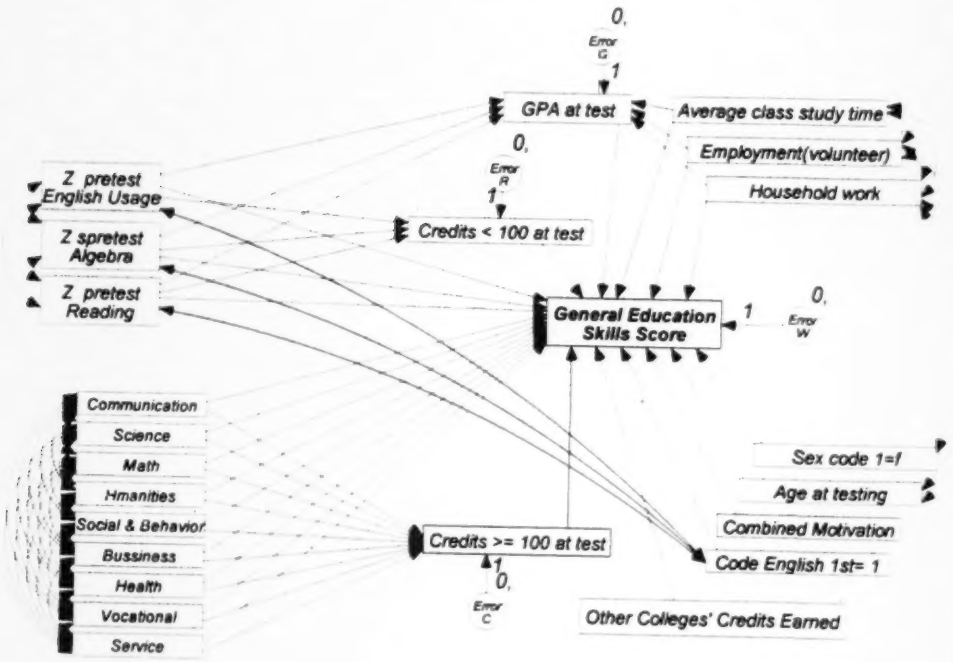
The process of model building began with this full model with each of the five general education skills as the central dependent variable. First the full model was calculated using all available cases. While each case included values for most of the variables, some cases were missing values for some variables. In this initial modeling, parameters were estimated based on all available cases. Missing variable values were estimated using established maximum likelihood procedures. This estimation of missing values made the fullest use of all of the cases collected. Each of these full models utilized between five and six hundred cases.

Each full model was then calculated a second time, using only the cases with complete data. Each of these models utilized between 153 and 179 cases. These complete data models were reduced to contain only significant paths and where possible to attain acceptable standards on two measures of fit.

Models from these two approaches were compared for substantial differences and patterns of similarity. These observations were then applied to develop a final model for each of the five general education skills areas that use all of the cases. In one model one non-significant path was retained in order to test or illustrate a "common sense" connection of specific interest. Finally, parameters on some of the exogenous variables were relaxed so that the models fit the data.

While the process of calculating and building these models is rampant with mathematical processes, standards and parameters for judging the models are still emerging from active exploration. The models presented need to be considered as best fit descriptions of the processes but far from perfect measures of the underlying processes. Their development is a mix of statistical modeling and theory with intuition. These models are best used for discussion, dialogue, and generating next inquiry hypothesis. The causal assumptions implied in the

statistical models are imposed by this researcher, and not tested through the data. Thus, theory and experience enter the specification of these models.



- Figure 1: Full Model

Two patterns of relationships occur in the models. In one of these patterns specific course work contributes directly to skill development. This pattern is most evident in the model for acquisition of mathematics skills. This is the first model presented. The acquisition of science reasoning skills model also illustrates this direct course pattern, but the course categories with direct impact are not just science oriented.

In the second of these patterns the general accumulation of course credits (at or greater than 100) contributes to skill development, while specific course impacts are either smaller or negative. This pattern is most evident in the model for acquisition of critical thinking skill, the third model presented. It is also evident in the models for acquisition of reading skills and writing skills.

The description of the model for acquisition of math skills is presented with the most detail about how to interpret and examine these models. Even if one is not interested in the math model, reviewing its presentation is the most instructive for interpreting all of the other models that follow.

Acquiring mathematics skills

The process of modeling is clearly illustrated by the model examining math skills. Figure 2 illustrates the reduced Mathematics Model. Straight, single headed arrows indicate statistically significant paths connecting variables. The path weight is a standardized regression coefficient, which may be interpreted as the standardized effect of the originating variable on the target variable controlling for the other variables in the model as indicated by arrows. These paths range from −1 to 1, although those paths nearest 0 are not significant and have been removed from the model. The use of standardized coefficients means that path coefficients can be compared with one another. In general, standarized coefficients can be interpreted similar to correctlion coeffficients with one added idea. The coefficients in these models indicate the relationship controlling for the other significant (and specified) variables in the model.

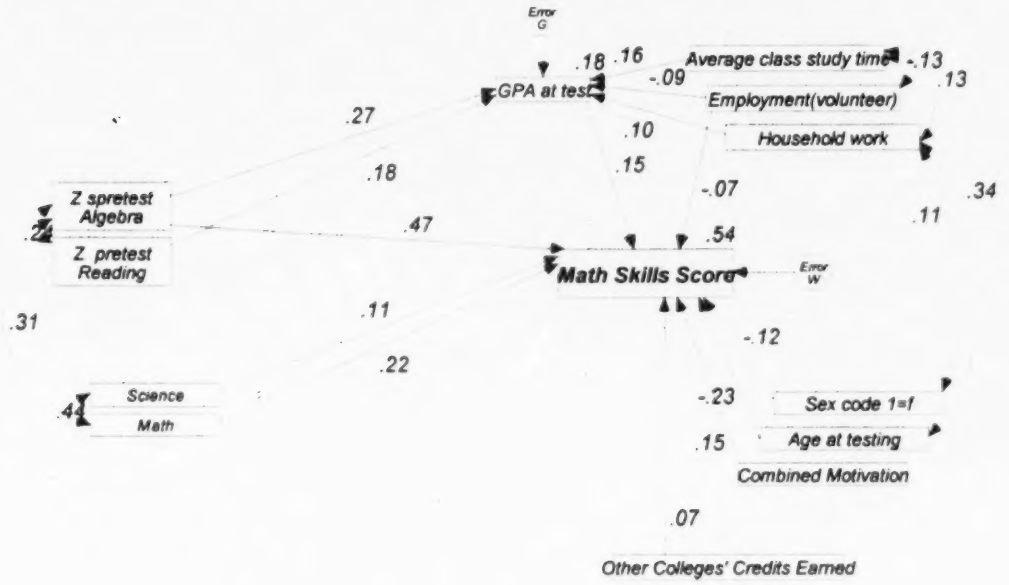
In the math model, the path from courses to math skills is .22. This coefficient is judged to be moderately strong. This coefficient can be interpreted as indicating that controlling for math pre-test scores, the more courses in mathematics the higher the level of math skills as measured by the CAAP test. "Well, of course," one might say. But, as discussed later, this pattern of direct impact from specific course counts is not found in many of the other skills areas.

The courses-in-math to math-skills path is stronger than the path from science courses to math skills that is .11. The path from the Z score of the math pre-tests at .47 is the strongest path in the model, and thus the best single predictor of math skill performance.

The curved arrows with heads at either end indicate covariance between variables, which are accepted in calculating the model. Accepting this covariance between exogenous variables is necessary to estimating the model. The covariance between endogenous variables can be indicative of unspecified relationships or problems with models or it may be a necessity for estimating the model. The accepted covariance paths are presented in the model for the purpose of full reporting; however, they are judged as acceptable necessities not interesting influences and will not be discussed further.

The model fits the data reasonable well and the variation in the independent and intervening variables in the model (z-pretest algebra, z-pretest reading, courses in science and math, GPA, study-time, employment, household work, gender, age, motivation, and other college credits earned) account for 54% of the variation in the math skills scores. This is the highest level of explained variance among the five models. This explained variance (squared multiple correlation) is the number presented in the model at the upper right corner of intervening variables and the dependent variable.

Math Skills
ChiSq= 267.985, df= 57, prob. = .000, cfi= .980



- Figure 2: Mathematics Model

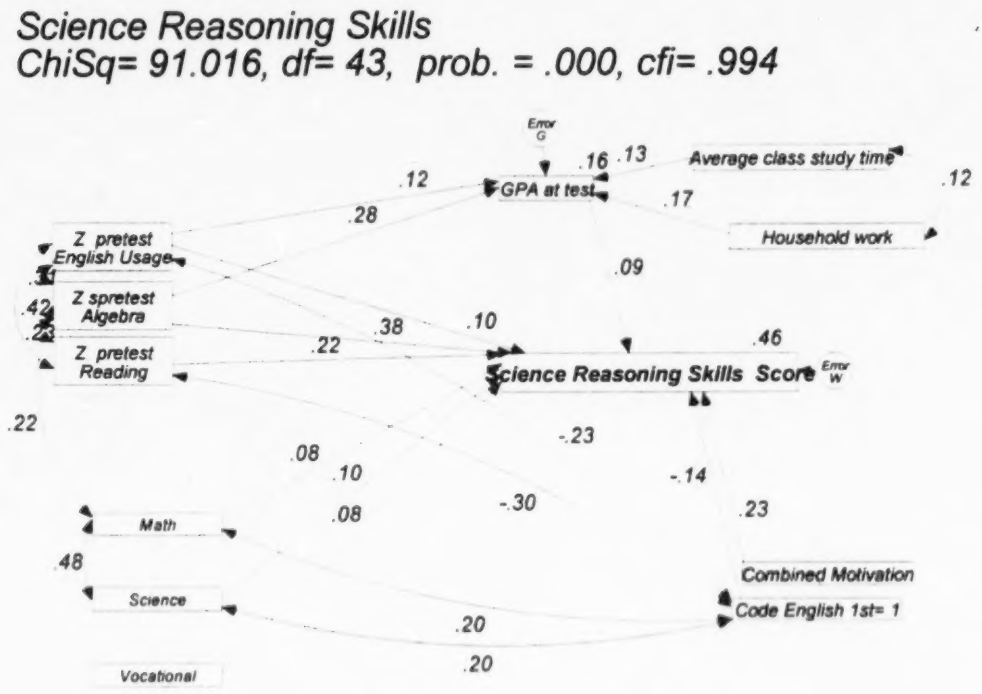
When examining the mathematics model three issues emerge.

- The model for mathematics acquisition indicates that courses in mathematics and science tend to increase math skills. There is evidence that courses enhance skills controlling for entering skill levels as measured by the pre-test.
- There is also evidence that these learning effects are tempered by a negative impact of both age (-.23) and gender (-.12 for females). The negative impact of age is one of the stronger paths in the model.
- This is the only one of the five models in which employment has both an indirect effect (-.09) and a direct effect (-.07) on skills acquisition. This may reflect the on-the-street word that "You have to do the homework if you want to learn the skills." That frequent homework takes time, something that competes with employment.

Acquiring science reasoning skills

Figure 3 illustrates the reduced Science Reasoning model. The model fits the data reasonably well and the variations in the independent variables and intervening variables in the model account for 46% of the variation in the science reasoning skills scores. The path from courses in science to science reasoning is .10 and that from math courses to science reasoning is .08. It is interesting to note that the number of vocational courses also has a positive effect (.08) on

science reasoning. This may be due in part to the nature of the test skills, which involve concrete and physical world problems.



- Figure 3: Science Reasoning Model

When examining the science reasoning model one conclusion can be supported.

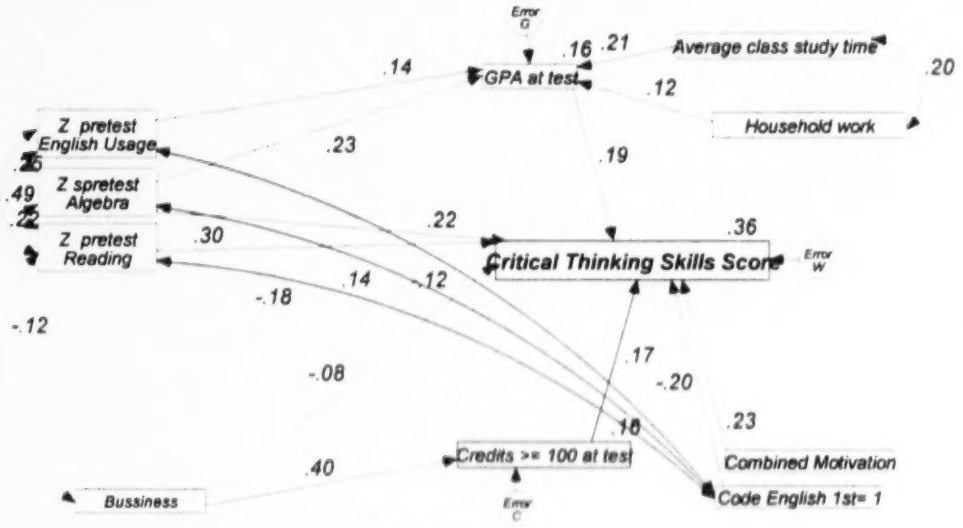
- The model for science reasoning acquisition indicate that course in science, math, and technical/vocational areas tend to increase science reasoning skills.

Acquiring critical thinking skills

With this model we examine a second pattern in general education skills acquisition, that of accumulated courses across the curriculum. Figure 4 illustrates the reduced Critical Thinking model. The model fits the data reasonably well and the variations in the independent variables and intervening variables in the model account for 36% of the variation in the critical thinking variable. This is the smallest explained variance among the five models being examined. The path from credit hours at or above 100 to the critical thinking skills score is .17, the highest coefficient for this relationship among all of the models. The only specific course impact in the model is a path from business courses to critical thinking; however, that path has a negative coefficient of -.08. This implies that those students with more business classes tend to have lower critical thinking scores controlling for the effects of pre-test scores, GPA, and being a native speaker of English.

The path from GPA to critical thinking skills is .19, the highest coefficient for this path among all of the models. This implies that a portion of the performance measured by GPA is a measurement of critical thinking skills applied within the course.

Critical Thinking Skills
ChiSq= 88.748, df= 35, prob. = .000, cfi= .993



- Figure 4: Critical Thinking Skill Model

When examining the critical thinking model three issues emerge.

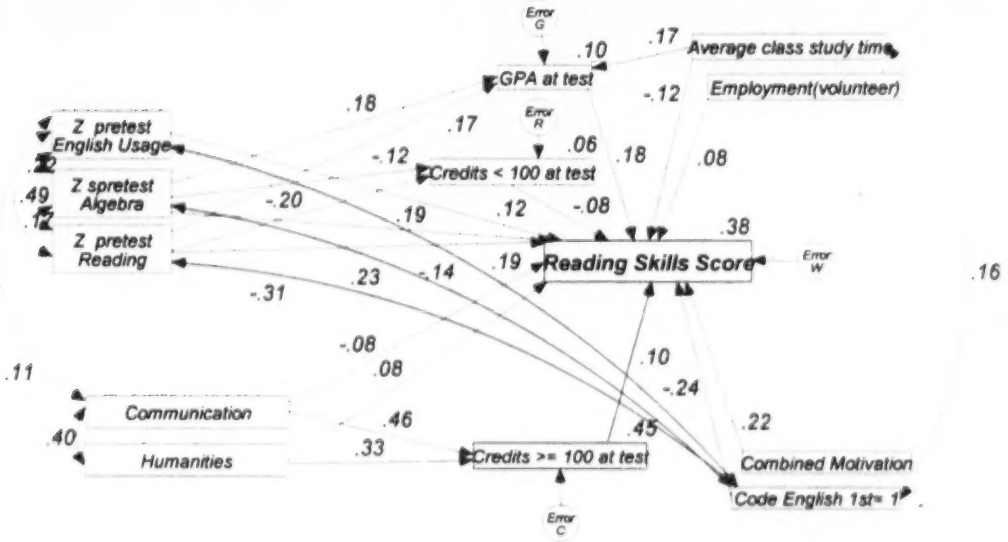
- The model for critical thinking skills acquisition indicates that the accumulation of courses in almost all categories tends to improve critical thinking skills.
- One possible explanation for this building of skills might be increasing maturity. However, this explanation is not supported since there is no significant relationship with age controlling for the other variables in the model.
- Time spent studying has no direct effect on critical thinking skills; however, study time does have a strong impact on GPA (.21 which means higher study time, higher grades).

Acquiring of reading skills

Figure 5 illustrates the reduced Reading Skills model. The model fits the data reasonably well and the variations in the independent variables and intervening variables in the model account for 38% of the variation in the reading skills scores. The model in Figure 5 contains two paths

from course counts, one from communication and one from humanities. The path from communication to reading skills is -.08 and the ratio of the coefficient to its standard error is -1.773 indicating a non-significant path. The paths from humanities to reading skills and from credits at or above 100 to readings skills are significant. If the model is further reduced by removing the communications reading skills path, then the humanities path become non-significant as does the credit >= 100. Removing the communication and humanities paths returns the model to approximately the same level of explanation as that in Figure 5 with the courses >=100 significant. Here then one can see that the issues of model building are not just mathematical in nature. Based on seeking an explanative model that is true to the patterns in the data, I'm reporting the model including both counts of communication (not significant) and humanities (significant).

Reading Skills
ChiSq= 120.581, df= 50, prob. = .000, cfi= .992



- Figure 5: Reading Skills Model

When examining the reading skills model four issues emerge.

- The model for reading skills acquisition indicates that accumulation of course work tends to increase college-reading skills.
- In addition to the effect of accumulation of courses, courses in humanities increase and courses in communication decrease, thus off-setting each other, reading skills acquisition.
- Time spent studying tends to increase GPA. And controlling for GPA, students spend less time studying when their reading skills are higher.

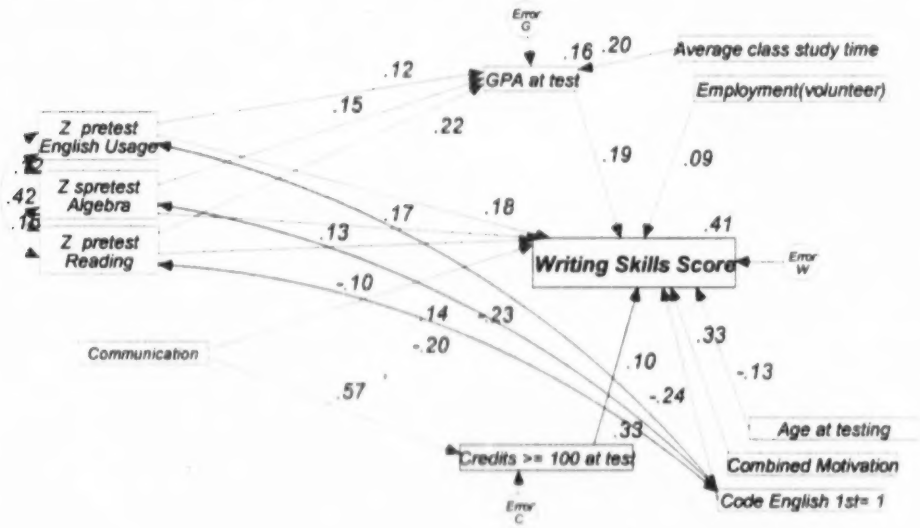
- Students spending more time employeed or volunterring have higher reading skills.

Acquiring writing skills

Figure 6 illustrates the reduced Writing Skills model. The model fits the data reasonably well and the variations in the independent variables and intervening variables in the model account for 41% of the variation in the writing skills scores. The path from accumulated courses >=100 to writing skills is .10, indicating a moderate impact on skills by courses completed. The path from communication courses to writing skills of -.10 is less interpretable. Some background may provide one possible explanation for this observation.

This area-test of the CAAP battery is a multiple choice format test. Some critics describe the writing skills tested in this area-test have been described as "editing" skills. Our prior use of the Essay test area-test, a test utilizing a writing sample, showed it to be insensitive to changes in student skills. Given that most students take only a three course sequence of English composition along with speech, it may be that those taking more courses in the communication area are those inclined to reject traditional rhetorical rules. Thus, the few students with more communication courses may also be the students with more non-traditional styles and thus less likely to score well on a traditional English rhetoric exam. An alternative explanation for this counter intuitive observation may lie in some complexity of the basic model being imposed. Exploration of this issue is not undertaken at this time.

Writing Skills
ChiSq= 172.647, df= 45, prob. = .000, cfi= .987



- Figure 6: Writing Skills Model

When examining the writing skills model two issues emerge.

- The model for writing skills acquisition indicates that the general accumulation of courses positively impacts writing skills.
- The impact of GPA on writing skills is equal to that in the critical thinking model (.19) indicating that writing skills performance is an important component of course performance.

Pretest and entry level skills

One of the issues central to assessment is the challenge of identifying effects attributable to a setting or event in contrast to those effects that are external to the setting or event. In response to this challenge these models use as control variables the z-scores of the pre-tests in English, Algebra, and Reading. It should be noted that the variable with the highest rates of missing data are missing pre-test scores. In future years inclusion of results from the Prarie State testing efforts and increased collecting of pre-tests from all students should help strenthen control for entry level skills.

The standardized coefficients from the significant paths between these pre-tests and each of the five dependent variables from the five models are listed in Table 39. The relative size of these coefficients indicates a substantial impact of prior skills on current skills. This supports a commitment to controlling for entry-level skills as an important part of modeling are skills acquisition or value added assessment.

- Table 39: Significant Standardized Coefficients - Pretests

	Math	Science	C.Think	Read	Write
Z-English		0.10		0.12	0.18
Z-Algebra	0.47	0.38	0.22	0.19	0.17
Z-Reading		0.22	0.30	0.19	0.13

Time commitments and outcomes

One of the issues frequently discussed with reference to community college students' educational achievement is the issue of competing time commitments and role-strains resulting form high levels of employment and family relationships that differ from traditional students. To examine these issues we included three questions focused on the time commitments to 1) studying for classes, 2) work, and 3) family commitments. These three variables were collected for students taking five of the six area tests. Respondents taking the Essay test did not consistently answer the institutional designated questions.

Table 40 lists the significant standardized coefficients of time commitments from each of the five models. In all five models the impact of study time on GPA is significant with a range from .13 to .21. All of these are moderate impacts. Also in all five of the models the connection of GPA with the general education skills is significant and range from .09 to .19. The coefficients for critical thinking, writing, and reading skills are similar and moderate. The remaining coefficients appear more unique to the specific models and tend to be weak in effect.

- Table 40: Significant Standardized Coefficients - Time

	Study	Employment	Household		Study	Employment	Household	GPA
GPA Math	0.16	-0.09	.10	Math		-0.07		0.15
GPA SR	0.13		0.17	SR				0.09
GPA CT	0.21		0.12	CT				0.19
GPA Read	0.17			Read	-0.12	0.08		0.18
GPA Write	0.20			Write		0.09		0.19

What then might be the important issues to note?

- Study time does have a direct impact of grade performance. Studying is recognized and rewarded with higher grades.
- General education skills are integrated and inherent parts of course work and grades in part reflect the levels of these skills students are able to bring to courses.
- Unlike our general common sense intuition, employment and household work do not appear to have a direct importance on grade performance, subject learning and acquisition of general education skills. Here we need to be careful to recognize that although specific individual students may find time and role conflicts a significant factor in their personal success in course work, there are other students with the same time conflicts and demands who acquire skills despite those challenges.

Motivation and demographic variables

For the first time this year our models include consideration of the self-reported motivation of the students taking these tests. The standardized path coefficients between motivation and the general education skills scores range from a high of .33 in the writing model to .15 in the math model. The coefficients in three of the models (critical thinking, science reasoning, and reading) are either .23 or .22. In all of the models these paths are among the strongest effects reported. Thus, the positive effect of motivation on student performance on the CAAP test is confirmed.

An interesting contrast is evident with the low coefficient in the math model. It appears that in the case of testing math skills, students either are able to complete or fail the testing challenges based on knowledge, and their scores are less impacted by motivation than in the other area-tests.

Given concerns among assessment practitioners about standardized testing and students' efforts and motivation, it may be important to consider how we should judge this factor. The implication for testing efforts appears to be a challenge to motivate student effort, while accepting that a range of efforts is demonstrated among all test takers. To the extent motivation is higher in a specific setting, that set of scores can be expected to out-shine results from similar students with lower motivation.

It is thus apparent that each report of student outcomes performance must be placed within the context of the testing setting and campus climate. Assessment researchers need to develop the controls appropriate to consider skills performance within the context of testing controlling for motivation. This report undertakes to report that context in our examination beginning on page 12.

Chapter

7 Conclusions

A focus for assessment of general education skills development at College of DuPage begins with the definition of general education. Based on our catalogue statement seven outcomes emerge. While it is our intent to gather evidence focusing on each of these outcomes, no single assessment measure provides a complete examination. The first three outcomes have, thus far, been assessed only through self-reports from students. Given that these are self-reported, the rankings may be considered as reflective evaluations rather than direct behavioral indicators. The next three outcomes are more easily examined using objective measures since they are skills based. Using the patterns of evidence gathered through three years of general education skills testing using the ACT-CAAP standardized tests, some general conclusions can be drawn. The following items summarize conclusions based on three year's of outcomes assessment. The averages reported in these conclusions are those for freshmen and sophomores at 2-year public colleges and 4-year public colleges and universities. In this report they are referred to as "national average." The averages used are those most recently published as the *Fall, 2000 CAAP User Norms*.

The aims of general education are to enable students to:

1. **Understand and appreciate their culture**
   Among completing sophomores, 33.7% report their College of DuPage courses have meaningful or significant impact on their **cultural appreciation**. This contrasts with 18.5% to 20.6% among entering first-year and mid-studies students. Although only about one-third of the students report significant impact, the change indicates a significant increase in students' evaluation through accumulating courses.

2. **Understand and appreciate their environment**
   Among completing sophomores, 30.5% report their courses have meaningful or significant impact on their environmental appreciation. This ranking is substantially higher than the 16.5% ratings among mid-studies students but lower than the 33.6% ranking among entering first-year students. While the percent ranking at the top two levels does not increase, the percent choosing the lowest two categories decreases with a substantial increase in the moderate impact ranking.

3. **Develop a system of personal values based on accepted ethics that lead to civic and social responsibility**
   Among completing sophomores, 39.2% report their courses have meaningful or significant impact on their developing a system of personal values based on accepted ethics that lead to civic and social responsibility. This contrasts with rankings of 29.5% among entering first-year and 21.7% among mid-studies students. The U-shaped reports of impacts may reflect first flush of exposure to college-level thinking, followed by mid-studies uncertainty and eventually beginning development of more complex ethical positions.

In each of these three assessments the restrictive nature of self-reports needs to be considered. These data may provide a beginning baseline for consideration and discussion.

The general education goals 4 through 6 are skills areas where direct indications of student proficiency were obtained from the ACT-CAAP testing over the past three years.

4. **Attain skills in analysis**

Assessment of skills development in analysis may be inferred from two of the subject area tests in the CAAP battery: critical thinking and scientific reasoning. Results from the Critical Thinking test indicate that our first-year students are similar to other 2-year students both of who are lower in skills than 4-year students. On average our completing sophomores demonstrate significantly higher critical thinking skills than our first-year students (t= -2.763, sig. .006). The COD sophomore average is similar to 2-year sophomores and is not statistically different from the 4-year sophomore average.

Results from the Scientific Reasoning test indicate that our first-year students are similar to other 2-year students both of who are lower in skills than 4-year students. On average our completing sophomores have improved significantly (t= -3.95, sig. .000). The COD sophomore average is similar to 2-year sophomores but significantly lower than 4-year sophomores.

Thus, in the area of developing general education skills in analysis as indicated by these two area tests, the students attending COD are in-step with other 2-year public college students.

5. **Attain skills in communications**

The broad goal of developing skills in communication is frequently divided into four more specific skills that are described by two dimensions. One of these dimensions is the format dimension of written and oral; the second dimension is the modality of receiving or producing. The four skills are reading, writing, listening, and speaking. CAAP skill-area tests cover two of these. In the area of writing skills, CAAP has both a multiple-choice instrument and a writing sample essay instrument. In the area of reading, CAAP examines college level skills in both the humanities and social sciences. The current general education skill development assessments do not include measures focused on listening nor on speaking skills.

Results from the college Reading indicate that our first-year students are similar to other 2-year students both of who are lower in skills than 4-year students. On average our completing sophomores have significantly improved (t= -2.21, sig. .029) from first-year averages. The COD sophomore average is similar to both 2-year and 4-year sophomores

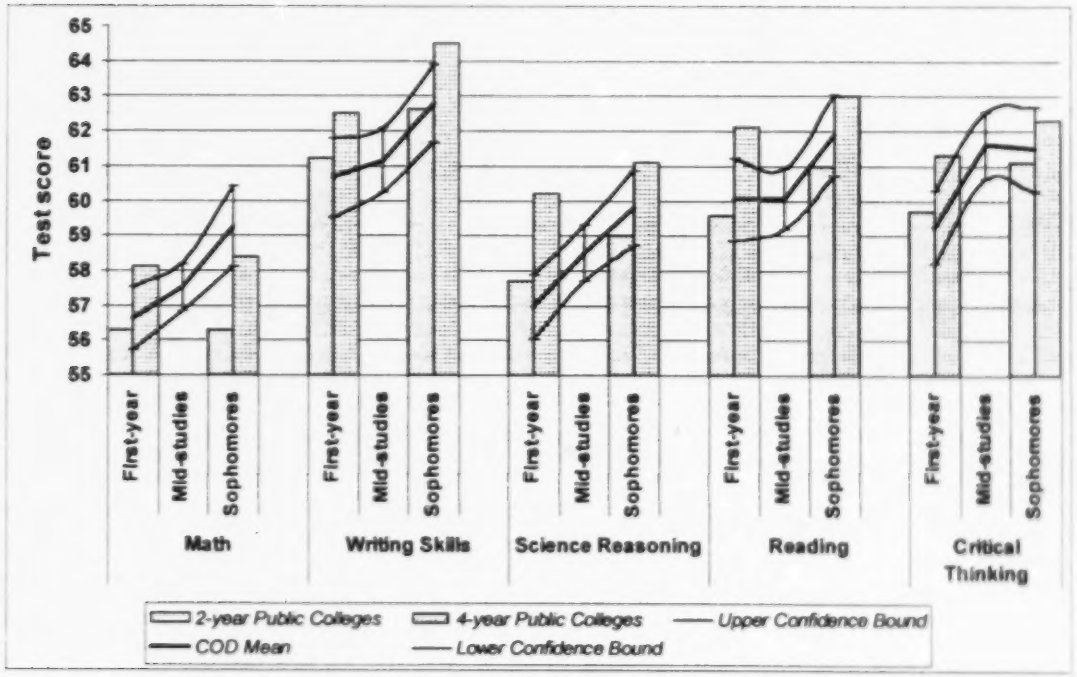
Results from the Writing Skills tests indicate that our first-year students are similar to other 2-year students both of who are lower in skills than 4-year students. On average our completing sophomores have significantly improved (t= -2.659, sig. .009). The COD sophomore average is similar to 2-year sophomores but still significantly lower than 4-year sophomores.

Results from the Essay test (a writing sample conducted from 1998 to 2000) indicate that our first-year students are similar to the 2-year college average both of who are higher in skills than the 4-year student average. On average our sophomores demonstrated no significant change (t= -.269, sig. .791). The COD completing sophomore average was significantly higher than the 2-year college average and is not statistically different from the 4-year sophomore average. Use of this test was suspended in the fall of 2000 after it was determined that we were at level and that the test lacked sensitivity to changes in students' skills. SOAC will be working to develop an alternative, effective writing sample instrument.

6. **Attain skills in quantification – mathematics**
   General education skills development in quantification is most directly linked to outcomes measured by the Mathematics CAAP area-test. Results indicate that our first-year students start out similar to other 2-year public college students both of whom are lower in skills than 4-year public college students. On average our completing sophomores have improved their math skills significantly (t= -3.57, sig. .000). The COD sophomore average is significantly higher than 2-year sophomores and similar to that of sophomores at 4-year public colleges.

Student Outcomes Assessment has yet to develop an indicator measure for the seventh general education focus.

7. **Attain skills in synthesis**
   Assessment of the seventh general education outcome requires gestalt approaches that have not yet been designed nor implemented. Some indication of student, employer, and community satisfaction in this area is possible from other assessments including student satisfaction surveys and community needs studies.



Summary of conclusions

The strongest pattern of development of general education skills by College of DuPage students is acquisition of mathematics -- quantification skills.

Also evident is a pattern of improvement in writing skills as measured through multiple-choice items covering understanding of conventions of standard written English.

Our students demonstrate significant increases in their science reasoning.

Although our students perform at national two-year norms, minimal significant change occurs in college reading skills. Improving college-level reading skills is probably the single most important outcome. It's worthy of support because college-level reading skills are direct prerequisites to critical thinking and reasoning.

First-year students enter and exit at two-year national average in their critical thinking skills. There is significant improvement in their critical thinking skills. This general education skill is one that can be developed in a wide variety of content and skills based courses.

No significant change occurs in development of essay writing skills as measured in a writing sample (which is similar to the pattern in the national norms).

The bottom line conclusion justified by these observations is that College of DuPage students are similar to other 2-year public community college students. However, it may be worth discussing whether being "average" is a sufficient goal for College of DuPage. Recognizing and implementing some classroom changes in pedagogy can increase our students' general education skills. Such development should focus on ways in which faculty can improve subject-area learning through supporting general education skills development across the curriculum. Improving general education skills development is a key to increasing student understanding and knowledge of content area and for the mid-range of our student body that development is best accomplished within the context of their subject-area courses.